SKF condition monitoring tools, technologies and training

The foundation for effective condition-based maintenance

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The SKF brand now stands for more than ever before, and means more to you as a valued customer.

While SKF maintains its leadership as a high-quality bearing manufacturer throughout the world, new dimensions in technical advances, product support and services have evolved SKF into a truly solutions-oriented supplier, creating greater value for customers.

These solutions enable customers to improve productivity, not only with breakthrough application-specific products, but also through leading-edge design simulation tools and consultancy services, plant asset efficiency maintenance programmes, and the industry's most advanced
supply management techniques.

The SKF brand still stands for the very best in rolling bearings, but it now stands for much more.

SKF – the knowledge engineering company

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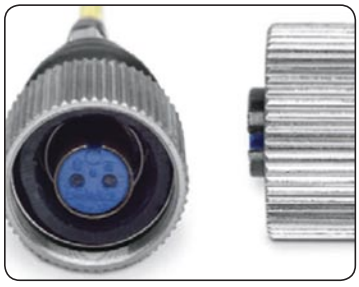

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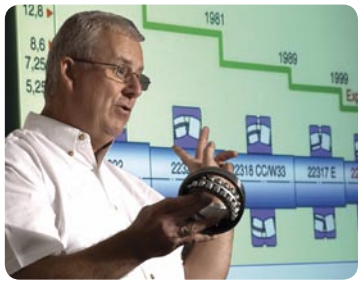

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Around the world, successful condition monitoring programs begin with SKF

Industrial operations everywhere acknowledge that condition monitoring is critical to the success of their maintenance strategy. With the right machine data – and the tools to interpret this data quickly, and with confidence – they can optimize maintenance for both productivity and long-term protection of their assets.

As a pioneer in the condition monitoring industry, SKF has led the way with innovations that have made it easier to collect, analyze, use and share machine

Handheld monitoring

SKF basic condition monitoring tools offer an easy way to begin using machine data to improve your overall equipment effectiveness. With minimal investment and training, you can use these handheld tools to spot-check critical machines and establish trends which enable you to identify problems early on. Basic kits are available, combining popular tools in one convenient package.

Portable data collectors and analyzers

SKF puts the power of knowledge engineering into your hands with a range of portable tools for measuring and assessing machine condition data. The family of SKF Microlog Analyzers sets the industry standard for functionality and ease of use. All tools are supported by SKF condition monitoring software, product support plans, as well as SmartStart product training.

Fault detection and sensors

SKF offers a number of early fault detection systems and sensors that enable users to monitor machinery, on-site or remotely, to identify problems before breakdowns occur. SKF provides a full range of robust industrial accelerometers and vibration transmitters, as well as Eddy Probe Systems. SKF Copperhead fault detection systems monitor machinery in mining, mineral processing, and cement industries.

Cables and enclosures

The SKF condition monitoring product assortment also includes a wide range of cables, junction boxes and enclosures. From cables of various lengths and styles, to junction boxes manufactured with coatings to suit specific operating conditions, SKF has the components necessary for proper installation and integration of virtually any system.

condition data. By enabling users to migrate from routine preventive maintenance to condition-based predictive maintenance, SKF condition monitoring solutions help eliminate the risk of unplanned downtime, reduce operational costs, and optimize manpower resources.

Whether your condition monitoring program is just getting off the ground or you are taking it to the next level, SKF has the tools, technologies and training you'll need to be successful.

Training

Through the Reliability Maintenance Institute (RMI) and RMI On-Line, SKF offers a comprehensive range of training courses to help you eliminate machinery problems and achieve maximum reliability and productivity. Training ranges from hands-on introductory level courses designed to familiarize maintenance personnel with basic condition monitoring techniques to advanced courses focusing on asset management optimization.

Handheld monitoring

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SKF Machine Condition Advisor
CMAS 100-SL

Machine monitoring, made simple

Designed to help simplify machine maintenance and prevent costly failures, the handheld SKF Machine Condition Advisor (MCA) puts the benefits of machine monitoring within reach for any maintenance and operations team.

By measuring machine vibration and temperature at the same time, the MCA can quickly and accurately assess the condition of rotating equipment throughout your facility.

Ideal for novice and expert users alike, the MCA makes it easy to implement basic maintenance practices without extensive training. Suitable for a wide range of industrial rotating machinery, the MCA can provide early warning of potential problems before failures occur.

SKF Machine Condition Advisor simultaneously measures vibration signals and temperature to indicate machine health or bearing damage.

Put SKF knowledge in your pocket

Although small enough to fit in your pocket, the Machine Condition Advisor delivers powerful signal processing and advanced, user-friendly features. The technology behind the MCA leverages decades of SKF machine design, machine monitoring experience and unparalleled knowledge of rotating machine reliability.

- Avoid costly failures
- Plan maintenance
- Reduce maintenance costs
- Improve machine reliability
- Ideal for both expert and novice users

Available in SKF assessment and monitoring kits. See Ordering details.

Features

- Can be used on most industrial machine applications including electric motors, pumps, compressors, gearboxes, fans and more
- Measures velocity, enveloped acceleration and temperature simultaneously
- Quick and easy to set up and use, measurements are shown on a bright display viewable in low light to direct sunlight
- Free on-line training is available at SKF @ptitude Exchange
- Lightweight, compact and ergonomically designed, it fits neatly at the belt line in a pocket or a tool kit
- Exceptionally durable, the unit is rated IP 54 for use in industrial environments
- Alert and Danger prompts provide increased diagnostic confidence
- Rechargeable unit operates 10 hours on a single charge
- Flexible enough to work with standard 100 mV/g constant current accelerometers. An optional external sensor can be used for hard-to-reach locations and for more repeatable and accurate measurement results

Multiple measurements from one device

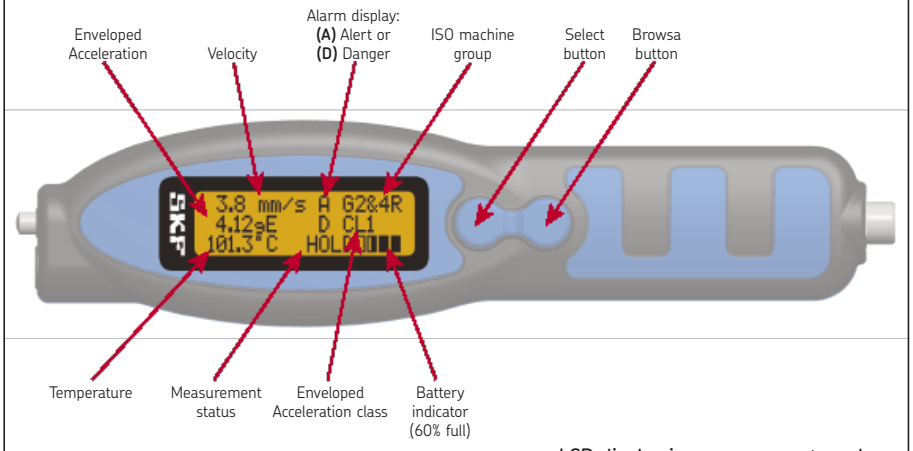
- Provides an overall velocity vibration reading that measures vibration signals and automatically compares them to pre-programmed ISO standards
- Applies an SKF technique called enveloped acceleration and compares it to established bearing vibration guidelines to indicate conformity or potential bearing damage
- Measures temperature using an infrared sensor to indicate uncharacteristic heat

Quick and easy – first time and every time

1. Press “Select” or “Browse” button to turn the SKF Machine Condition Advisor on
2. Press the sensor tip against the point to be measured
3. When the readings stabilize, press the “Select” button to hold the reading
4. Read and record the measurement values

Depending on the system setting, the front-panel LCD simultaneously displays:

- Units in metric or English
- Velocity in mm/s RMS or IPS derived Peak
- Temperature in Celsius or Fahrenheit
- Acceleration enveloping readings in gE



LCD display in measurement mode

Ordering details

Order no.	Description
CMAS 100-SL	SKF Machine Condition Advisor unit, including: Belt holster, charger (international DC power supply), charger adapter cable, user manual in English, and CD containing: User manual PDF files in English and Spanish, link to SKF @ptitude Exchange for training, SKF Machine Condition Advisor trend worksheet (Excel file)

Accessories

Order no.	Description
CMAC 105	Extension sensor kit, 100 mV/g accelerometer with 1,5 m integral cable and magnet
CMAC 107	Connection cable, 1.5 m with M8 socket type connector for standard ICP 100 mV/g accelerometer (ICP: integrated circuit piezoelectric)

Replacement parts

Order no.	Description
CMAC 101	Charger adapter, cable 101,6 mm *(4 in.)*, connector to 5,5 mm power
CMAC 8002	Charger, international DC power supply, +5 V, 1 600 mA, 90 to 264 VAC, 47 to 63 Hz
CMAC 106	Magnet, magnet base, 19 mm *(0.75 in.)* diameter, 4,5 kg *(10 lbs.)* pull-strength
CMAC 102	Belt holster

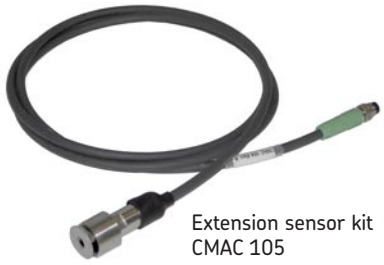
Kits that include the SKF Machine Condition Advisor, CMAS 100-SL

Designation	Description
CMAK 200-SL	SKF Electric motor assessment kit. See page 16 for details.
CMAK 300-SL	SKF Bearing assessment kit. See page 17 for details.
CMAK 400-ML	SKF Basic condition monitoring kit. See page 18 for details.
CMAK 450-ML	SKF Energy monitoring kit. See page 19 for details.

Accessories

Extension sensor kit CMAC 105

The extension sensor kit contains an accelerometer with integral cable and items needed to take measurements from hard-to-reach places and for more repeatable and accurate measurement results.


Extension sensor kit CMAC 105

- 100 mV/g Accelerometer
  - Small size case 12,70 x 26,67 mm *(0.5 x 1.05 in.)* and footprint 12,7 mm *(0.5 in.)*
  - Frequency range 0,32 Hz to 10 kHz (±3 dB)
  - Each accelerometer is fully enclosed in a potted and waterproof stainless steel case
- Integral cable (1,5 m)
  - Connector to MCA
- Magnet
  - 4,5 kg *(10 lbs.)* pull-strength, 19 mm *(0.75 in.)* diameter

Connection cable (1,5 m) CMAC 107

Optional connection cable for standard ICP accelerometers with 100 mV/g, MIL-SPEC connector.

Connection cable CMAC 107

SKF Machine Condition Detector Pro IS
CMVL 3600-IS-K-01-C

Intrinsically safe automatic collection of vibration and temperature data

The SKF Machine Condition Detector Pro IS (MCD) is certified Intrinsically Safe (IS) for use in the hazardous environments typically found in the petrochemical industrial marketplace.

The MCD provides for velocity, enveloped acceleration, and temperature monitoring with general alarm capabilities and has ATEX and North American hazardous locations approvals.

- Multi-parameter measurements, including vibration velocity, enveloped acceleration, and temperature
- Red, yellow and green LED alarms for quick Go/No Go indication of equipment status for enhanced user confidence
- QuickConnect mechanical/computerized studs for fast, quarter-turn connection which temporarily fastens the probe to a measurement point

The MCD provides for velocity, enveloped acceleration, and temperature monitoring with general alarm capabilities and has ATEX and North American hazardous locations approvals.

Go/No Go machine monitoring

The sensor of the MCD affixes to a machine point via an SKF QuickConnect Stud or magnetic base for automatic collection of vibration and temperature data.

Green, yellow, and red LEDs provide easy-to-interpret indications of machine status, so operations or maintenance personnel can quickly identify the need for more in-depth analysis on a particular machine.

Vibration monitoring and enveloped acceleration

Velocity vibration identifies phenomena which are observable in the low to mid frequency range, and indicates such structural problems as misalignment, unbalance, mechanical looseness, and more.

Moreover, events which occur in the higher frequency ranges such as bearing and gear problems, can also be detected by the MCD with its enveloped acceleration capability, a signal processing technique which focuses on enhancing the repetitious vibration signals that characterize such problems.

Temperature

Temperature measurements enhance the “early warning” benefit of the MCD by offering a useful indication of mechanical condition or the load applied to a specific component, because, as a bearing or its lubricant fails, friction causes its temperature to rise.

General alarm capabilities

The MCD is easily programmed for six alarm settings, which include the “alert” and “danger” levels for each of the three measurements. When measurements are taken, they are automatically compared to six user-defined settings, and the MCD’s alarm indicator and LED react appropriately.

An “alert” condition is an early warning of impending problems for which immediate in-depth analysis should be performed.

A “danger” alarm indicates that a problem has escalated to a point where actions must be made quickly to avoid a serious failure.

QuickConnect studs for quality, repeatable data collection

Specially designed mechanical and computerized studs enable users to collect consistent, accurate, and repeatable data from each measurement point.

Engineered to work exclusively with the MCD, the QuickConnect mechanical/computerized studs provide for a fast, quarter turn connection which temporarily fastens the probe to a measurement point. This reduces the possibility of errors and inconsistencies often resulting from data collected by a variety of individuals using varying techniques.

CMCP600 Bearing fault demonstrator

Ordering details

Order no.	Description
CMVL 3600-IS-K-01-C	SKF Machine Condition Detector Pro IS probe, including: SKF QuickConnect 1/4-28 stud, temperature magnet for probe, two (2) “AA” Alkaline batteries, setup key, padded carrying case, user manual, quick start card

QuickConnect and mounting accessories

Order no.	Description
CMSS 2600-3	SKF QuickConnect mechanical M8 x 1,25 mounting thread-three (3) studs per package
CMSS 2610-3	SKF QuickConnect mechanical 1/4-28 mounting thread-three (3) studs per package
CMSS 2601-3	SKF QuickConnect computerized (patent pending) M8 x 1,25 mounting thread – three (3) studs per package
CMSS 2611-3	SKF QuickConnect computerized (patent pending) 1/4 x 28 mounting thread – three (3) studs per package
CMAC 9600-01	Tool kit for spot face 1/4-28
CMAC 9600-02	Tool kit for spot face M8 x 1,25
CMAC 9600-03	Drill bit for 1/4-28 kit
CMAC 9600-04	Tap for 1/4-28 kit
CMAC 9600-05	Pilot for 1/4-28 kit
CMAC 9600-06	Drill bit for M8 x 1,25 kit
CMAC 9600-07	Tap for M8 x 1,25 kit
CMAC 9600-08	Pilot for M8 x 1,25 kit
CMAC 9600-09	End mill or counter bore for either kit

Replacement parts

Order no.	Description
CMAC 3620	SKF Machine Condition Detector Pro IS setup key
CMAC 3610	Temperature magnet for SKF Machine Condition Detector Pro IS probe
CMAC 3630	Probe tip replacement kit for temperature magnet for SKF Machine Condition Detector Pro IS
CMAC 3611	Magnetic probe tip for SKF Machine Condition Detector Pro IS

SKF MicroVibe P
CMVL 3860-ML

Vibration monitoring and analysis power, without complexity

With the SKF MicroVibe P, vibration assessment is as close and convenient as your PDA. This economical vibration meter expansion module fits in a PocketPC's compact flash card slot (CF Type II) and features the user-friendly Windows Mobile Operating System. Identify problems and assess machine condition quickly and easily with this versatile and easy-to-use pocket tool.

Simplified vibration assessment

The SKF MicroVibe P collects and displays overall vibration readings and automatically provides expert judgment of the measured velocity and overall enveloped acceleration levels, enabling immediate, accurate, and reliable assessment of machine or bearing condition.

Power without complexity

Built-in automatic functions virtually eliminate setup, while analytical displays and automatic judgment of machine vibration readings help users identify machine problems on the spot.

- Ideal for small route data collection
- Quickly identify problems with expert judgment criteria based on ISO vibration severity standard and SKF bearing condition evaluation
- Utilizes the two most common vibration sensors-accelerometers and dynamic velocity transducers
- Simultaneously collects vibration measurements including acceleration, velocity, displacement, and enveloped acceleration in FFT spectrum and time waveform displays
- FFT Spectrum analysis enables user to pinpoint problems like unbalance, misalignment, bearing faults, rubs, etc.
- Stores and recalls up to 2 000 overall vibration signals, 1 000 FFT spectrums, and 200 time waveforms for more focused analysis and trending
- Data management software enables transfer of vibration data to a computer for trending and analysis

Audio analysis

Simply connect the earphones and listen to measured vibration signals. When abnormal noise is detected, the vibration analysis capabilities help determine the type and severity of the problem.

Data management and software

You can extract, save, edit, and display data in both English or metric units. Upload data to your computer for analysis and trending using the data management software. Once uploaded, vibration data, overall trends, and spectra can be stored, trended, graphically displayed, and even exported to Microsoft Excel.

Automatic setup and onboard expertise

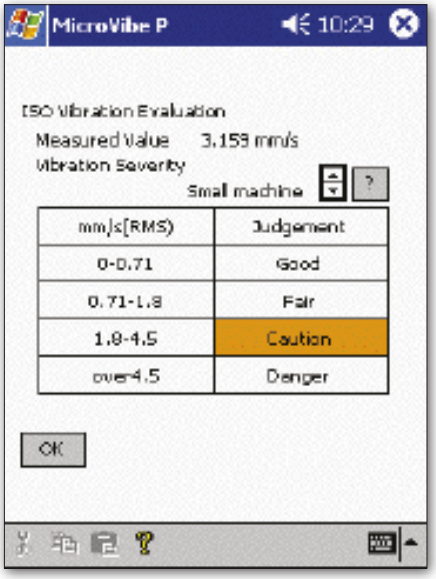
The SKF MicroVibe P has automatic setup and extensive evaluation of vibration results. Compares readings to pre-programmed velocity and enveloped acceleration severity criteria for accurate evaluation of machine vibration levels. This helps even novice users to easily determine abnormal conditions and take appropriate action.

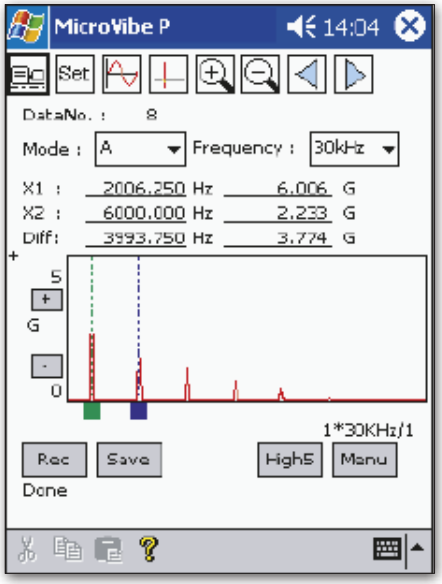
FFT spectrum analysis

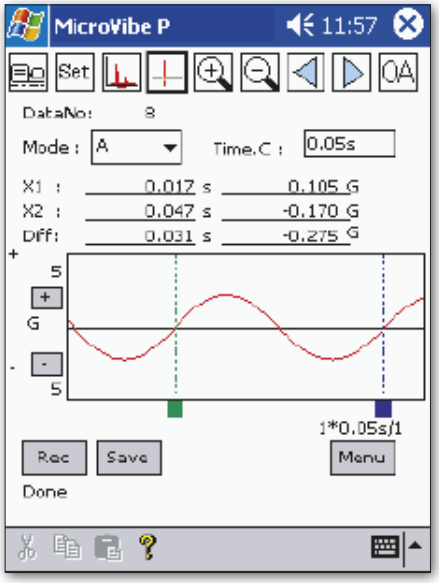
Cursor position readout with display zoom optimizes your analysis power. In addition, it tabulates and displays the highest vibration peaks from a spectrum, making it easy to quickly identify signals indicative of specific machine problems, like misalignment, imbalance, rubs, or bearing faults.

Time waveform displays

Time waveform displays are available for acceleration, velocity, displacement, or enveloped acceleration measurements. A unique “automatic transient capture” feature automatically starts data collection when the measured vibration signal exceeds a user-specified trigger level, enabling more detailed analysis of the pre- and post-trigger events surrounding a change in machine condition.







Ordering details

Order no.	Description
CMVL 3860-ML	SKF MicroVibe P Kit, including: module, accelerometer, 1,5 m *(5 ft.)* integral cable with plug and stinger, two-bar magnetic base, high strength 40 lb. pull, earphones, data management software CD-ROM and manual, user manual, quick start guide, CE declaration of confirmation, and carrying case. Note: Pocket PC (PDA) NOT INCLUDED.
CMVL 3860-ML-PPC	SKF MicroVibe P with Pocket PC, including: CMVL 3860-ML and Hewlett Packard – HP iPAQ 210/211 Pocket PC with English operating system Windows Mobile 6.0

Accessories and Replacement parts

Order no.	Description
CMSS 3811	Accelerometer, 1,5 m *(5 ft.)* integral cable with plug
CMSS 3812	Velocity pickup sensor, 1,5 m *(5 ft.)* integral cable with plug
CMAC 3825	Two-bar magnetic base, high strength 18 kg *(40 lb.)* pull
CMAC 3830	Earphones
CMAC 3835	Certified Pocket PC's (PDA) with Windows Mobile 2006 – Hewlett Packard – HP iPAQ 210/211

Note: SKF MicroVibe P also works with Certified Pocket PC's (PDA) with Windows Mobile 2005 – Hewlett Packard – HP iPAQ hx2490/2495 or iPAQ hx2790

SKF Infrared Thermometer
CMSS 3000-SL

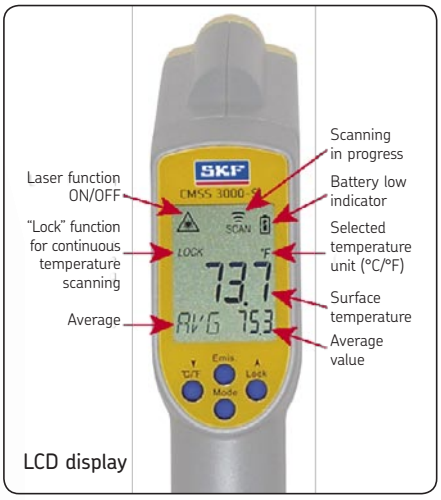
Heavy duty, long range, dual laser non-contact infrared thermometer

Rugged and easy to use – just aim, pull the trigger, and read the temperature in less than a second. Measure surface temperatures of hot, hazardous, moving, or hard-to-reach objects safely without physical contact. Ideal for a broad range of maintenance tasks.

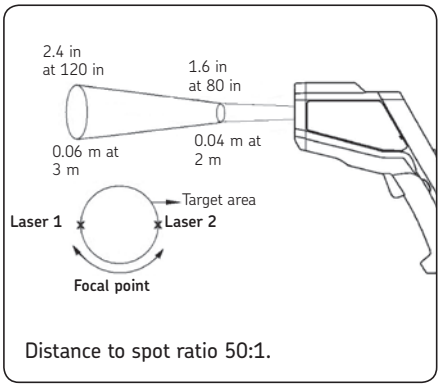
- Dual point lasers provide easy aiming and define the target area
- Adjustable emissivity for more accurate measurement of different surface materials
- 50:1 Distance to spot size ratio
- Temperature range: –60 to +1 000 °C *(–76 to +1 832 °F)*
- Selectable temperature units (°C or °F)
- Exceptional battery life with low battery indicator (140+ hours)
- Programmable high and low audible alarm
- MAX, MIN, DIF, AVG temperature displays with “Lock” function for continuous temperature scanning
- Bright amber, back-light LCD display
- High intensity, white LED flashlight
- Heavy duty magnet in base of handle
- Water resistant, dust-proof hard case

The non-contact thermometer senses the thermal energy radiated from an object with an infrared detector. When pointed at an object, the infrared detector collects energy, producing a signal that the microprocessor translates as a reading on the backlit display. As the trigger is squeezed, the object temperature is continuously measured by the infrared detector. This allows for fast and accurate real-time readings.

Available in SKF assessment and monitoring kits. See Ordering details.



LCD display



Distance to spot ratio 50:1.

Dual laser sighting and distance to spot ratio

Dual lasers provide easy aiming and define the target area. The target area is highlighted at all distances with two laser dot markers. Laser 1 indicates one point of the measurement spot on one side of the target area to be measured and Laser 2 indicates the location of the diametrically opposed point on the other side of the measurement spot. At the focal point, where the spot size is the smallest, the dots line up vertically, rotating as the SKF Infrared Thermometer is moved closer or further from the target.

Ordering details

Order no.	Description
CMSS 3000-SL	SKF Non-contact Infrared Thermometer, including quick start guide, two AAA batteries, hard carrying case and magnetic stand
Available on request	National Institute of Standards and Technology (NIST) Certificate of Calibration Accuracy (Watlow-Gordon XACT-CAL)

Kits that include the Infrared Thermometer CMSS 3000-SL

Order no.	Description
CMAK 300-SL	SKF Bearing assessment kit. See page 17 for details.
CMAK 400-ML	SKF Basic condition monitoring kit. See page 18 for details.
CMAK 450-ML	SKF Energy monitoring kit. See page 19 for details.

Note: Under an electromagnetic field of 3 V/m from 90 to 360 MHz the maximum error is ±10 °C

SKF Thermal Camera
TKTI 10

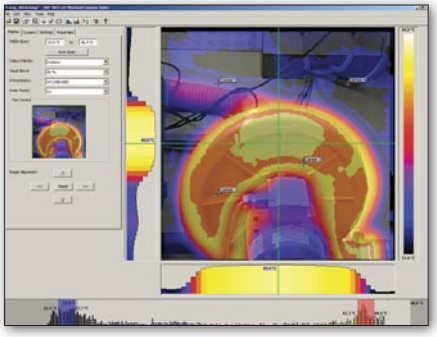
Digital camera with extensive thermal imaging capabilities

The SKF Thermal Camera TKTI 10 is an extremely user-friendly camera designed especially for use by maintenance technicians to visualize troublesome hotspots quickly and easily.

This unique thermal camera requires no special training and by simply pointing at the application, hotspots are rapidly identified. Moreover the images can be stored and analyzed using the advanced thermal imaging capabilities.

The camera captures both digital and thermal images, which can be blended, allowing you to easily interpret and analyze the scene. Powerful PC software for analysis and report-writing is supplied as standard, enabling you to perform comprehensive image analysis and produce professional reports.

- Compact, lightweight, ergonomic design
- Captures and displays both digital and thermal images
- Blend function allows a mixture of digital and thermal images for easy interpretation
- Non-contact measurement technique allows measurements to be made safely on running equipment
- Laser pointer pinpoints the center of the image area



Powerful analysis software

- Wide temperature measurement range (in °C and °F) from –10 to 300 °C *(14 to 660 °F)* suitable for most applications
- High and low temperature audible and visual alarms are easily set to quickly detect abnormal temperatures
- Images can be voice and/or text annotated so that situation details can be recorded pertinent to the image
- Isotherms, temperature gradients, area analysis and two user-selectable cursors can be displayed on the camera screen, allowing advanced scene analysis

- 8 different selectable color pallets for ease of viewing
- Bright, backlit, 3 1/2 in. landscape screen with clear sharp image resolution
- Rechargeable integrated lithium-ion battery with 6 hour running time
- Large image storage capacity, up to 1 000 radiometric and visual images
- Multilingual menus
- Advanced thermal image processing and report-writing software supplied
- IP 54 suitable for industrial environments
- Removable handle

Camera with handle removed

Ordering details

Order no.	Description
TKTI 10	SKF Thermal Camera, including removable handle, Micro SD card (1GB), USB connection cable, Universal AC adaptor (UK, USA, European & Australian plugs), carrying case, CD containing IFU and software, and Quick Start Guide

SKF Inspector 400 Ultrasonic Probe
CMIN 400-K

Easy detection of high frequency sounds

The SKF Inspector 400 Ultrasonic Probe senses high frequency sounds produced by operating equipment, leaks and electrical discharges. It electronically translates these signals by a heterodyning process, making them audible, so that a user can hear these sounds through a headset and see them as intensity increments on a meter. The high frequency, short wave nature of ultrasound allows operators to pinpoint problems even in noisy environments.

The SKF Inspector 400 Ultrasonic Probe is easy to use and can detect early stages of machine problems. This simple approach to inspection can save time, money, and energy and can be a compliment to your condition monitoring program.

- Detects pressure and vacuum leaks, including compressed air
- Inspects steam traps for blow-by, machine gunning, oversized traps and line blockage
- Detects leaks in valve seats and exhaust systems
- Locates leaks in fittings, valves, and flanges in heat exchanger, boilers and condensers
- Detects arcing, tracking, and corona in electric apparatus
- General mechanical inspection of bearings, pumps, motors, compressors, gearboxes and more

Available in SKF assessment and monitoring kits. See Ordering details.

Valve leakage

Ordering details

Order no.	Description
CMIN 400-K	SKF Inspector 400 Ultrasonic Probe Stethoscope/Scanner Kit including: Probe pistol housing with LED bar graph meter, 8-position sensitivity selection, low battery indicator, scanning module, rubber focusing probe, stethoscope module, lightweight foam headset, 9-volt alkaline battery, and user manual.

Accessories and replacement parts

Order no.	Description
CMAC 8600-1	Lightweight foam lined headset
CMAC 8600-2	Deluxe noise isolating headphones
CMAC 8600-3	Deluxe noise isolating headphones to be worn with hard hat
CMAC 8600-4	Utility belt with holster
CMAC 8600-5	Patented liquid leak amplifier, case of (12) 240 ml *(8 oz.)* bottles, (used for extremely low level leaks 1 x 10^{-6} mil/s)
CMAC 8600-6	Stainless steel unisonic scanning module
CMAC 8600-7	Stainless steel stethoscope/contact module
CMAC 8600-8	Stethoscope extension rods
CMAC 8600-9	Rubber focusing probe

Kits that include the 400 Ultrasonic Probe CMIN 400-K

Order no.	Description
CMAK 400-ML	SKF Basic condition monitoring kit. See page 18 for details.
CMAK 450-ML	SKF Energy monitoring kit. See page 19 for details.

SKF Electrical Discharge Detector Pen TKED 1

Unique, reliable and safe way to detect electrical discharges in electric motor bearings

The SKF Electrical Discharge Detector Pen (EDD Pen) is a simple to use hand-held instrument for detecting electrical discharges in electric motor bearings.

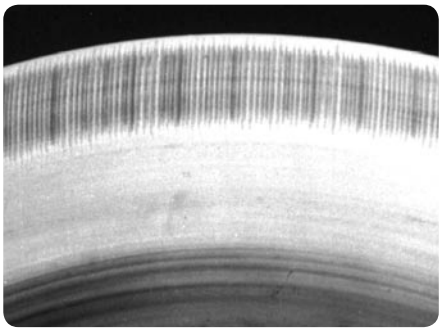
Electrical discharges are a result of motor shaft voltages discharging to earth through the bearing, causing electrical erosion, lubricant degradation and ultimately bearing failure.

Electric motors are more vulnerable to suffer electrical erosion in bearings when controlled by a Variable Frequency Drive.

When incorporated in a predictive maintenance program, the EDD Pen can help detect bearings more susceptible to failure, and significantly prevent unplanned machine downtime.

- Unique remote solution allows operation at a distance from the motors which protects the user from touching machinery in motion
- No special training required
- Capable of detecting electrical discharges on a time base of 10 seconds, 30 seconds, or indefinite
- LED backlit screen allows use in dark environments
- IP 55 (Ingress Protection) rating for protection against dust and water

Lubricant degradation caused by electrical discharge currents



Fluting marks characteristic of electrical erosion in bearing

Available in SKF assessment and monitoring kits. See Ordering details.

Ordering details

Order no.	Description
TKED 1	SKF Electrical Discharge Detector Pen including batteries, a spare antenna, carrying case, and instruction for use.

Kit that includes the Electrical Discharge Detector Pen TKED 1

Order no.	Description
CMAK 200-SL	SKF Electric motor assessment kit. See page 16 for details.

SKF Electric Motor Assessment Kit
CMAK 200-SL

The SKF Electric Motor Assessment Kit makes the assessment of electric motors a simple task for maintenance, operations, reliability, and vibration analysis departments.

- Inspect and assess electric motor machine condition
- Measure velocity, temperature, and enveloped acceleration in electric motors and other operating equipment
- Safely detect electrical discharges in electric motors
- Ideal for novice and expert users

SKF Machine Condition Advisor
CMAS 100-SL

The SKF Machine Condition Advisor simultaneously measures machine vibration signals and temperature to indicate machine health and bearing condition.
Details shown on page 6.

SKF Electrical Discharge Detector Pen
TKED 1

The SKF Electrical Discharge Detector Pen is a simple to use hand-held instrument for safely detecting electrical discharges in electric motor bearings.
Details shown on page 15.

Ordering details

Order no.	Description
CMAK 200-SL	SKF Electric Motor Assessment Kit includes: SKF Machine Condition Advisor and SKF Electrical Discharge Detector Pen

SKF Bearing Assessment Kit
CMAK 300-SL

The SKF Bearing Assessment Kit makes the assessment of bearing condition a simple task for maintenance, operations, reliability and vibration analysis departments.

- Check bearing and lubrication condition
- Inspect and assess overall machine condition
- Measure velocity, temperature, and enveloped acceleration in operating equipment

SKF Machine Condition Advisor *CMAS 100-SL*

The SKF Machine Condition Advisor simultaneously measures machine vibration signals and temperature to indicate machine health and bearing condition.
Details shown on page 6.

SKF Infrared Thermometer *CMSS 3000-SL*

The heavy duty Infrared Thermometer is a dual laser sighted, non-contact instrument for long range application.
Details shown on page 12.

Convenient carrying case

The instruments are packaged in a light, durable aluminum carrying case for industrial environments.
Weight: 2,6 kg *(5.7 lb.)* case only
Dimensions:
Length 450 mm *(18 in.)*
Width 330 mm *(13 in.)*
Depth 150 mm *(6 in.)*

SKF OilCheck monitor *TMEH1*

The SKF OilCheck indicates the degradation and contamination level of oil, and detects increased mechanical wear and loss of the oil's lubricating properties.

- Shows changes in oil condition effected by:
  - Water content
  - Fuel contamination
  - Metallic content
  - Oxidation
- Handheld and user friendly
- Numerical readout to facilitate trending

The SKF OilCheck measures the changes in dielectric constant of an oil. By comparing the measurements obtained from used and new oils of the same type and brand, the SKF OilCheck is able to determine the degree of change in the condition of the oil.

Dielectric change is directly related to the degradation and the contamination level of the oil and will allow the user to achieve optimized intervals between oil changes and detect increased mechanical wear and loss of the oil's lubricating properties. To facilitate trending, the instrument is equipped with numerical read-out.

Note: The SKF OilCheck is not an analytical instrument. It is an instrument to detect changes in the oil condition only. The visual and numerical readouts provide a guide and enable trending of the comparative readings of a good oil to a used oil of the same type and brand.

Ordering details

Order no.	Description
CMAK 300-SL	SKF Bearing Assessment Kit includes: SKF Machine Condition Advisor, SKF Infrared Thermometer, SKF OilCheck, and case

SKF Basic Condition Monitoring Kit
CMAK 400-ML

The SKF Basic Condition Monitoring Kit makes machine health monitoring a simple task for maintenance, operations, reliability and vibration analysis departments.

- Inspect and assess overall machine condition
- Measure vibration, temperature, high frequency sound and enveloped acceleration in operating equipment
- Ideal for novice and expert users

SKF Machine Condition Advisor *CMAS 100-SL*

The SKF Machine Condition Advisor simultaneously measures machine vibration signals and temperature to indicate machine health and bearing condition.

Details shown on page 6.

Extension sensor kit for the SKF Machine Condition Advisor *CMAC 105*

The external vibration sensor with magnet provides convenience for hard-to-reach surfaces and more repeatable and accurate measurements.

Details shown on page 7.

Convenient carrying case

The instruments are packaged in a light, durable aluminum carrying case for industrial environments.
Weight: 2,6 kg *(5.7 lb.)* case only
Dimensions:
Length 450 mm *(18 in.)*
Width 330 mm *(13 in.)*
Depth 150 mm *(6 in.)*

SKF Infrared Thermometer *CMSS 3000-SL*

The heavy duty SKF Infrared Thermometer is a dual laser sighted, non-contact instrument for long range application.

Details shown on page 12.

SKF Inspector 400 Ultrasonic *Probe CMIN 400*

The SKF Inspector 400 Ultrasonic Probe senses high frequency sounds produced by operating equipment, leaks, and electrical discharges and makes them audible so operators can pinpoint problems even in noisy environments.

Details shown on page 14.

Ordering details

Order no.	Description
CMAK 400-ML	SKF Basic Condition Monitoring Kit includes: SKF Machine Condition Advisor, SKF Extension sensor kit, 100 mV/g accelerometer with 1,5 m integral cable and magnet, SKF Infrared Thermometer, SKF Inspector 400 Ultrasonic Probe, and case.

SKF Energy Monitoring Kit
CMAK 450-ML

For compressed air systems

The SKF Energy Monitoring Kit makes it possible for any facility to potentially lower their energy cost and reduce their CO_2 emissions by monitoring and optimizing the energy used by their compressed air systems.

- Facilitate significant energy and cost reductions without major capital expense
- Measure energy data and condition monitoring data at the same time
- Inspect and assess overall machine condition
- Measure vibration, temperature, high frequency sound and enveloped acceleration in operating equipment
- Ideal for novice and expert users

SKF Machine Condition Advisor *CMAS 100-SL*

The SKF Machine Condition Advisor simultaneously measures machine vibration signals and temperature to indicate machine health and bearing condition.
Details shown on page 6.

Extension sensor kit for the SKF Machine Condition Advisor *CMAC 105*

The external vibration sensor with magnet provides convenience for hard-to-reach surfaces and more repeatable and accurate measurements.
Details shown on page 7.

SKF Infrared Thermometer *CMSS 3000-SL*

The heavy duty SKF Infrared Thermometer is a dual laser sighted, non-contact instrument for long range application.
Details shown on page 12.

SKF Inspector 400 Ultrasonic Probe *CMIN 400*

The SKF Inspector 400 Ultrasonic Probe senses high frequency sounds produced by operating equipment, leaks, and electrical discharges and makes them audible so operators can pinpoint problems even in noisy environments.
Details shown on page 14.

Hioki Clamp-On Power Meter *CPT3169-20*

Instrument used for obtaining energy related measurements for energy conservation programs, ISO 14001 testing, and electrical equipment diagnosis. Measures voltage, current, active power, reactive power, apparent power, power factor, integrated value, frequency, and harmonics.

- Measure up to two three-phase, two-wire systems
- Measure up to four single-phase, two-wire systems
- 5 A to 5 000 A range, PC card data storage
- Power recording for individual waveforms
- Simultaneous recording of demand values and harmonics

continued on next page

Hioki Power Meter Clamps
CPT9661

Clamp-on sensor for use with the Hioki Clamp-on Power Meter.

- CE approved for input up to 500 A AC
- Sensors with a safety barrier to protect the user from direct contact with live conductors

Convenient carrying case

The instruments are packaged in a light, durable aluminum carrying case for industrial environments.
Weight: 4,2 kg *(9.3 lb.)* case only
Dimensions:
Length 660 mm *(26 in.)*
Width 330 mm *(13 in.)*
Depth 178 mm *(7 in.)*

Ordering details

Order no.	Description
CMAK 450-ML	SKF Energy Monitoring Kit includes: SKF Machine Condition Advisor, SKF Extension sensor kit, 100 mV/g accelerometer with 1,5 m integral cable and magnet, SKF Infrared Thermometer, SKF Inspector 400 Ultrasonic Probe, Hioki Clamp-on Power Meter, Hioki Power Meter Clamps and case.

Technical data

SKF Machine Condition Advisor (page 6)

Designation	CMAS 100-SL
Vibration pickup	
Internal	Integrated piezoelectric acceleration
External	Accepts ICP type 100 mV/g accelerometer
Temperature sensor	Internal infrared temperature sensor
Measurements	
Velocity	Range: 0,7 to 65 mm/s (RMS), 0.04 to 3.60 in./s (equivalent Peak), meets ISO 10816
	Frequency: 10 to 1 000 Hz, meets ISO 2954
Enveloped acceleration	Range: 0,2 to 50,0 gE
	Frequency: Band 3 (500 to 10 000 Hz)
Temperature	Range: –20 to +200 °C *(–4 to +392 °F)*
	Infrared temperature accuracy: ±2 °C *(±3.6 °F)*
	Distance: Short range, maximum 10 cm *(4 in.)* from target
Operating temperature range	
In use	–10 to +60 °C *(14 to +140 °F)*
While charging	0 to +45 °C *(32 to +104 °F)*
Storage temperature	
Less than one month	–20 to +45 °C *(–4 to +95 °F)*
More than one month but less than six months:	–20 to +35 °C *(–4 to +95 °F)*

Designation	CMAS 100-SL
Humidity	95% relative humidity, non-condensing
Enclosure	IP 54
Approvals	CE
Drop test	2 m *(6.6 ft.)*
Weight	125 g *(4.4 oz.)*
Dimensions	
Length	200 mm *(7.90 in.)*
Width	47 mm *(1.85 in.)*
Height	25,4 mm *(1.00 in.)*
Battery capacity	550 mAh
Battery life	10 hours before charging again (≈1 000 measurements)
	With external sensor: Up to 55% less battery life
Supported external sensor	Any standard accelerometer with 100 mV/g sensitivity that needs ICP (Integrated circuit-piezoelectric)
External sensor power	24 V DC at 3,5 mA
Charger specifications	Universal AC/DC wall plug-in
	Input: 90 to 264 V AC, 47 to 60 Hz
	Output: 5 V DC regulated
	3 to 4 hours for a full charge

SKF Machine Conditioner Advisor Accessory	100 mV/g Accelerometer
Dynamic performance	
Sensitivity (±10 %)	10.2 mV/(m/s²) *(100 mV/g)*
Measurement range	±490 m/s² *(±50 g)*
Frequency range (±3 dB)	0.32 to 10 kHz
Mounted resonant frequency	22 kHz
Amplitude linearity	±1%
Transverse sensitivity	7%
Electrical	
Settling time	≤2 sec
Excitation voltage	18 to 30 V DC
Excitation constant current	2 to 20 mA
Output impedance	<150 Ω
Output bias voltage	8 to 12 V DC
Electrical case isolation	>10⁸ Ω
Electrical protection	RFI/ESD
Integral cable	0,3 mm² *(22 AWG)*, +105 °C *(+221 °F)*

SKF Machine Conditioner Advisor Accessory	100 mV/g Accelerometer
Environmental	
Shock limit	49 km/s² peak (5 000 g peak)
Temperature range	–54 to +85 °C *(–65 to +185 °F)*
Spectral noise	
10 Hz	78,5 (mm/s²)/√Hz (8 µg/√Hz)
100 Hz	49,1 (mm/s²)/√Hz (5 µg/√Hz)
1 kHz	39,2 (mm/s²)/√Hz (4 µg/√Hz)
Mechanical	
Size	12,70 x 26,67 mm *(0.50 x 1.05 in.)*
Weight (including 1.5 m cable)	70,7 g *(2.5 oz.)*
Mounting thread	1/4-28 UNF-2B
Mounting torque	2,7 to 6,8 Nm (2 to 5 ft./lb.)
Sensing element	Ceramic/shear
Case material	Stainless steel
Sealing	Potted
Wrench flats	7/16 in.

Technical data

SKF Machine Condition Detector Pro IS (page 8)

Designation	CMVL 3600-IS
Measurements	
Vibration pickup	Integrated piezoelectric acceleration (ceramic, shear type)
Measurement range	
Velocity	0,3 to 55 mm/s (RMS), *(0.02 to 3.00 in./s)* (equivalent Peak). Meets ISO Standard 10816-1.
Enveloped acceleration	0,3 to 20,0 gE
Temperature	0 to +100 °C *(32 to +212 °F)*
Frequency range	
Overall velocity	10 Hz to 1 kHz (Tolerances measured within the frequency range are in accordance with ISO 3945)
Enveloped acceleration band 3:	500 Hz to 10 kHz
Display	
Viewing area	54,99 x 17,78 mm *(2.165 x 0.700 in.)*
Power	
Main power	Two (2) 1.5 V alkaline "AA" batteries
Battery lifetime	30 hours
Backup battery	One (1) 3 V BR1225 Lithium ion battery
Auto off	Two (2) minute countdown on last operation
Hazardous area ratings	
Intrinsic Safety (IS)	
ATEX Class I, Division 1, Groups A, B, C, D T3A (USA, Canada)	II1G EEx ia IIC T4 (Ta = –20 to +40 °C)

Designation	CMVL 3600-IS
Physical characteristics	
Case	Water and dust resistant (IP 65)
Drop test	Six (6) feet on multiple axes
Dimensions	
Length	190,5 mm *(7.50 in.)*
Width	43,2 mm *(1.70 in.)*
Height	41,4 mm *(1.63 in.)*
Weight	431 g *(0.95 lb.)* with battery, 635 g *(1.4 lb.)* with temperature magnet probe tip
User environment	
Operating temperature	
Ordinary locations	–20 to +60 °C *(–4 to +140 °F)*
Hazardous locations	–20 to +40 °C *(–4 to +104 °F)*
Storage temperature	–37 to +70 °C *(–34 to +158 °F)*
Humidity	5 to 95% noncondensing
Communications port	
Type	Micro D RS 232
QuickConnect interface	
Receptacle	1/4 turn 5/8-24 two (2) lead thread with contact
Accessories to fit	
SKF QuickConnect	QuickConnect Stud series – CMSS 26xx Temperature Magnet
10 cm *(4 in)* Stinger	CMSS 60139-04

SKF MicroVibe P (page 10)

SKF MicroVibe P Accessory	CMSS 3811 Accelerometer
Type	Pre-amp is built-in, shear type
Power supply	±5 V DC
Voltage sensitivity	20 mV/g
Resonance frequency	20 kHz approximate
Frequency range	3 to 10 000 Hz
Maximum acceleration	500 m/s²
Vibration limit	5 000 m/s²
Maximum output voltage	±1 V
Output impedance	Below 100 Ω
Temperature range	–20 to +80 °C *(–4 to +176 °F)*
Material	SUS
Weight	60 g *(2.1 oz.)* approximate
Tapped hole	M6, P = 1, depth 5 mm, internal thread
Integral cable	Length 1,5 m *(5 ft.)*
Connector	Eight pin modular plug
Structure	Dust-proof, spray-proof

SKF MicroVibe P (page 10)

Designation	**CMVL 3860-ML**
Minimum PDA requirements*	Conforms to the Pocket PC specifications
Operating system	Microsoft Windows Mobile 3.0/5.0/6.0
Processor	ARM processor
Interface	Compact Flash TYPE II Slot 3.3 V only
Recommended specifications	
Processor	PXA255 400 MHz or higher
Memory (RAM)	64 MB or higher
Interface with Pocket PC	Compact Flash TYPE II Slot 3.3 V only
Power supply	+3.3 V (supplied by Pocket PC)
Current	
Standby	44 µA
Under measurement	48 mA
Pickup input (PU IN)	
AC voltage signal	Maximum ±2.5 V
Input terminal	Eight pin modular jack (RJ-45), ICP type pre-amp built-in accelerometer is not connected.
Raw waveform output (PU OUT)	
AC voltage signal	Maximum ±2.5 V
Output terminal	Mini-jack (2,5 mm F)
Sampling frequency	Maximum 76.8 kHz (changes according to mode) 76.8 kHz/38.4 kHz
Aliasing filter	20 kHz/2 kHz (changes according to mode and sampling frequency)
A/D	16-Bit
Dynamic range	90 dB
Lines of resolution	1 600/800/400
Averages	8/4/2/1
Window	Hanning
Frequency range	
Acceleration	10 Hz to 30 kHz (upper frequency is selectable)
Velocity	10 Hz to 1.0 kHz
Displacement	10 Hz to 150 Hz
Enveloped Acceleration Filter	E1: 5 Hz to 100 Hz
	E2: 50 Hz to 1.0 kHz
	E3: 500 Hz to 10 kHz
	E4: 5 kHz to 20 kHz
Temperature range	0 to +45° C *(32 to +113 °F)*
Humidity range	<90% relative humidity, non-condensing
Weight	25 g *(0.88 oz.)* approximate (card only)
Dimensions	
Width	42,1 mm *(1.66 in.)*
Height	60,0 mm *(2.36 in.)*
Depth	16,9 mm *(0.67 in.)*
Shape	Conforms to CF Card TYPE II, Card Type. See photograph.
Color	Black

** May not work with all PDAs.*

SKF Infrared Thermometer (page 12)

Designation	CMSS 3000-SL	Designation	CMSS 3000-SL
Measurement range	–60 to +1 000 °C *(–76 to +1 832 °F)*	**Distance spot ratio**	50:1
Operating range	0 to +50 °C *(32 to +122 °F)*	**Dimensions**	
Accuracy (T_{object} = 15 to 35 °C, $T_{ambient}$ = 25 °C)	±1,0 °C *(±1,8 °F)*	Height	203,3 mm *(7.90 in.)*
Accuracy (T_{object} = 33 to 1 000 °C; $T_{ambient}$ = 23 ±3 °C)	±2% of reading or +2 °C *(+4 °F)* whichever is greater	Width	197,0 mm *(7.71 in.)*
Update frequency	1.4 Hz	Depth	47,0 mm *(1.85 in.)*
Wave length response	8 to 14 µm	**Weight:**	386,1 g *(13.62 oz.)* including batteries
Emissivity range	0.95 default – adjustable 0.1 to 1 step 01	**Power**	Two AAA batteries (included)
Relative humidity	5 to 95% non-condensing	**Battery life**	Typical 180 hours, minimum 140 hours continuous use, (Alkaline, without laser and back light)
Resolution (from –9,9 to +199,9 °C)	0,1° C /0,1 °F	**Modes**	Maximum, Minimum, Average Difference (max–min), Lock (allows for continuous temperature scan)
Response time (90%):	<1 sec	**Hard case**	Water resistant, dust-proof case
		Dimensions	330 x 197 x 66 mm *(13.00 x 7.75 x 2.60 in.)*

Note: Under an electromagnetic field of 3 V/m from 90 to 360 MHz the maximum error is ±10 °C

SKF Thermal Camera (page 13)

Designation	TKTI 10
Performance	
Temperature range	–10 to +350 °C *(14 to +660 °F)*
Field of view (FOV)	20° x 20°
Spectral Response	8 to 14 µm
Sensitivity	~0,3 °C @ 30 °C
Thermal detector/ visual camera	47 x 47 pixel array (interpolated to 180 x 180) /2 Mega pixel digital camera
Emissivity Correction	User selectable 0,1 to 1,0 in steps of 0,01 Emissivity table of common surfaces built-in with reflected ambient temperature compensation
Accuracy	The greater of ±2 °C or ±2% of reading in °C
Frame rate	8Hz
Focal range	0,3 m *(19 in.)* to infinity
Image storage	Up to 1 000 images on Micro SD card supplied
Display	3 1/2 in. color LCD with LED Backlight. 8 color palettes. Mixed thermal and visual images
Laser pointer	Built in Class 2 laser
Imager Power Supply	
Battery	Lithium-ion field rechargeable
Operation time	Up to 6 hours continuous operation
AC operation	AC adaptor supplied
Mechanical & Environment	
Temperature operating	–5 to 45 °C *(23 to 113 °F)*
Humidity	10% to 90% non condensing
Storage range	–20 to 60 °C *(–4 to 140 °F)*
Ingress protection	IP 54
Dimensions	210 x 120 x 90 mm *(8.3 x 4.8 x 3.5 in.)*
Weight	0,70 kg *(1.5 lbs.)*
Software	Advanced imager analysis and report writing software
Computer Requirements	PC with minimum of 300 MHz processor, MS Windows XP 128 Mb RAM 16 bit color graphics with 1024 x 768 capability

SKF Inspector 400 Ultrasonic Probe (page 14)

Designation	CMIN 400-K
Construction	Handheld ABS pistol type ultrasonic processor, stainless steel sensor enclosures
Circuitry	SMD/solid state hybrid heterodyne receiver
Frequency response	20 to 100 kHz (centered at 38 to 42 kHz)
Indicator	10 segment LED bar graph (red)
Sensitivity selection	Eight position precision attenuation
Power	9 V alkaline battery
Low battery voltage indicator	LED
Headset	Lightweight foam lined double headset wired monophonic impedance; 16 ohms
Probes	Scanning module stainless steel unisonic (single transducer) piezoelectric crystal type; stethoscope/contact module stainless steel plug-in type with 5.5 in. stainless steel waveguide
Rubber focusing probe	Shields stray ultrasonic signals and focuses detected signals
Response time	300 millisec
Ambient operating temperature range	0 to +50 °C *(32 to +120 °F)*
Relative humidity	10 to 95% noncondensing at up to +30 °C *(+86 °F)*
Storage temperature	–18 to +54 °C *(0 to +130 °F)*
Dimensions:	
Height	133 mm *(5.25 in.)*
Width	50 mm *(2.00 in.)*
Length	203 mm *(8.00 in.)*
Weight	320 g *(11 oz.)*
Carrying case	Cordura/nylon soft pack with die cut foam

SKF Electrical Discharge Detector Pen (page 15)

Designation	TKED 1
Power supply	4.5 V, 3 x standard AAA batteries (LR03, AM4)
Time control	
Presets	10 or 30 seconds
Default	indefinite
Operational and storage temperature	0 to 50 °C *(32 to 122 °F)* –20 to 70 °C *(–4 to 158 °F)*
Ingress protection level	IP 55
Display	LCD counter range: 0 to 99 999 discharges. User selectable backlight and low battery warning
Case dimensions (w x d x h)	255 x 210 x 60 mm *(10 x 8.3 x 2.3 in.)*
Total case and contents weight	0,4 kg *(0.88 lbs.)*

SKF OilCheck monitor (page 17)

Designation	TMEH1	Designation	TMEH1
Suitable oil types	Mineral and synthetic oils	**Dimensions**	
Repeatability	Better than 5%	Width	95 mm *(3.7 in.)*
Readout	Green/red grading, numerical value (0 to 100)	Height	250 mm *(9.8 in.)*
Battery	9 V Alkaline IEC 6LR61	Depth	32 mm *(1.3 in.)*
Battery lifetime	> 150 hours or 3 000 tests		

Technical data

Hioki Clamp-on Power Meter (page 19)

Designation	CPT3169-20
Measurement line type (50/60 Hz)	Single-phase, two-wire system
	Single-phase, three-wire system
	Three-phase, three-wire system
	Three-phase, four-wire system
Number of systems that can be measured (for systems that share the same voltage)	
Single-phase	Two-wire, four systems
	Three-wire, two systems
Three-phase	Three-wire (measures the voltage and current for two lines) two systems
	Three-wire (measures the voltage and current for all three lines) one system
	Four-wire (measures the voltage and current for three lines) one system
	Four-wire (measures the voltage for three lines and the current for four lines) one system
Measurement range	
Voltage	150 to 600 V, three ranges
Current (when using Hioki Power Meter Clamps CPT9661)	5 to 500 A, five ranges
Power	75 W to 9 MW, 108 combination patterns
Basic accuracy	±0,2% single reading, ±0,1% full scale plus clamp-on sensor accuracy (active power, at 45 to 66 Hz)
Clamp sensor accuracy	Hioki Power Meter Clamps CPT9661 (rated for 500 A) ±0,3% single reading, ±0,01% full scale (full scale is the sensor's rated primary current value)
Frequency characteristic	Fundamental waveforms up to the 50th order ±3% full scale plus measurement accuracy (of a 45 to 66 Hz fundamental waveform)
Other functions	PC card (One slot, PC card standard compliant Type II, Flash ATA card type), (9727/9728 PC card, 256 MB to 512 MB
	RS 232C (Printer or PC connected to an RS 232C interface)
	External input/output
Display update rate	Approximately every 0,5 seconds (except when using a PC card while accessing the internal memory, or when performing RS 232C communications)
Power supply voltage rating	100 to 240 V AC, 50/60 Hz
Dimensions	
Width	210 mm *(8.27 in.)*
Height	160 mm *(6.30 in.)*
Depth	60 mm *(2.36 in.)*
Weight	1,2 kg *(42 oz.)*
Accessories supplied	Voltage cord set (one cord each of black, red, yellow, and blue), one (1) set each
	Power cord, one (1) each
	Input cord label, one (1) each
	Operating manuals – advanced edition and Quick Start Guide
	Advanced edition and RS 232C interface operating manuals (CD)

Hioki Power Meter Clamps (page 20)

Designation	**CPT9661**
Rated input current	500 A AC
Rated output current	0.5 V AC
Accuracy (at 45 to 66 Hz)	
Amplitude	±0,5% single reading, ±0,2% full scale
Phase	±0,5° or less
Frequency characteristics	66 Hz to 5 kHz (±1% or less from accuracy)
Maximum allowable input	Continuous 550 A rms (45 to 66 Hz)
Maximum circuit voltage	600 V AC rms (insulated wire)
Core jaw diameter	∅ 46 mm *(1,81 in.)*
Dimensions	
Width	77 mm *(3.03 in.)*
Height	151 mm *(5.94 in.)*
Depth	42 mm *(1.65 in.)*
Weight	360 g *(12.7 oz.)*
Cord length	3 m *(9.84 ft.)*

Portable data collectors and analyzers

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SKF Microlog Analyzers

Portable data collection and analysis for predictive maintenance

Unmatched versatility, reliability and functionality have made the SKF Microlog Analyzer series of data collectors the premier choice for portable, hand-held condition monitoring units.

Designed to help users establish or upgrade an existing condition monitoring program, SKF Microlog Analyzers handle the tasks required to perform predictive maintenance on rotating machinery in countless industries.

Data capture from a range of sources

SKF Microlog Analyzers automatically collect both dynamic (vibration) and static (process) measurements from almost any source, including handheld and magnetically mounted accelerometers, permanently mounted vibration sensors, or on-line monitoring systems. Temperature measurements can be collected with a non-contact infrared sensor, or with a contact probe.

State-of-the-art operating technology

With robust, high-speed data processors and optimum data storage capacity, SKF Microlog Analyzers are equipped to operate within today's most advanced computerized maintenance management systems. All units are programmed to function with the latest Windows operating system for direct access/data transfer to PC environments using USB connectivity.

Rugged, ergonomic design

SKF Microlog Analyzers are built to withstand punishing industrial environments, and are designed to be easy to handle. These IP 65-rated units seal out dust and water, and can withstand multiple drops from six feet. The units also feature function keys with right or left-hand operation, color liquid crystal displays, and red, amber, and green LED alarm indicators for enhanced visibility.

Separate analysis modules meet changing needs

Units can be upgraded with a range of individual modules for specific types of analysis. Users can select the features required to meet their plant's monitoring needs, then upgrade the data collector to build new functionality – without having to buy another instrument. *For more information, see page 36.*

One-year Product Support Plan

Each SKF Microlog Analyzer bundle includes a full year of the Premier Product Support Plan, which provides unlimited technical support, firmware upgrades, preventive maintenance, loaner units, and a one-year subscription to SKF's @ptitude Exchange knowledge based web portal. *For more information, see page 36.*

SmartStart training

SmartStart product start-up training is also included with each SKF Microlog Analyzer bundle. This on-site product startup service focuses on getting the SKF Microlog Analyzer up and running, your employees trained, and your program implemented quickly and effectively. This training is conducted by an SKF Reliability Maintenance Institute instructor. *For more information, see page 67.*

SKF Microlog Analyzer overview

MX

GX-E

GX-M

AX-M

	MX	GX-E	GX-M	AX-M
Channel(s)				
single		✓		
up to 2	✓		✓	
up to 4				✓
Routes				
Non-route	✓		✓	✓
Single-route		✓		
Multi-route			✓	✓
Software				
Analysis and Reporting Software	✓		+	+
Basic Vibration Analysis System		✓		
SKF @ptitude Analyst			✓	✓
Analysis Modules				
Conformance check	✓			+
Balancing	+		✓	✓
FFT analyzer	+		✓	✓
Bump test	+		+	+
Run up Coast down (RUCD)	+		+	+
Frequency response function (FRF)	+		+	+
Data recorder	+		+	+

✓ **Standard with the Microlog bundle**

\+ **Available add-on modules**

SKF Microlog Analyzer MX

Easy-to-use 2-channel tool handles a range of applications

Combining the functionality of several instruments in one handheld device, the SKF Microlog Analyzer MX can be used for machinery diagnostics, production line quality testing, or as a field service tool.

The unit comes pre-installed with the Conformance Check module, providing the user with a simple-to-use "go/no-go" test. You can choose an appropriate test from an existing library of standards, or create custom standards using the conformance set-up generator tool to set your own limits.

Developed for use by both vibration experts and non-experts, the MX features an intuitive user interface with step-by-step on-screen instructions. The unit also uses color coding to highlight test status, alert users to invalid measurements, abnormal conditions, and grade current machinery condition.

Offering a modular approach, the MX allows you to add features as your needs grow. New analysis modules can be easily uploaded to build functionality.

SKF Analysis and Reporting software

- PC-based application for transferring, displaying and analyzing data
- Provides direct uploading of data from the MX; with a mouse-click, data is automatically displayed in an interactive graphical plot
- Browse and manipulate data using a familiar Microsoft Windows Explorer-style tree display
- Generate text-based reports or plots in various graphic formats
- All data can be saved as CSV files for direct import into SKF Analysis and Reporting software or Microsoft Excel

Key features

- Conformance Check module provides user with a simple "go/no-go" test that assesses up to 64 individual fault criteria
- Supports 2-channel, non-route-based collection
- Simple to use for non-vibration experts
- Modular, flexible analysis functionality
- On-screen user assistance
- Ergonomic design with large color display
- Easy operation function keys
- Easy data transfer and storage

Upgrade analysis modules

- FFT analyzer
- Bump test (packaged with FFT analyzer)
- Balancing
- Data recorder
- Frequency response function (FRF)
- Run up Coast down (RUCD)

Ordering details

Order no.	Description
CMXA44 1ADS-US*	SKF Microlog MX bundle includes: CMXA44 instrument with Conformance Check module, battery, rubber bump sleeve, USB communication cable, power adapter/ battery charger, power cable, user manual on CD, accelerometer kit (accelerometer with integral 2 m cable 100 mV/g and magnetic mount), hand strap, leather neck strap, hard shell carrying case, and Analysis and Reporting PC software. One year of Premier Product Support Plan (coverage begins at time of shipment).
WICM253*	SmartStart Training for Microlog MX (3 days onsite training, including 5 manuals).

* SmartStart Training is part of the bundled package of goods and services. The SKF Microlog MX (CMXA44 1ADS-US) must be ordered in combination with the SmartStart Training for SKF Microlog MX (WICM253).

SKF Microlog Analyzer GX-E

“Entry-level” unit enables route-based data collection

The SKF Microlog Analyzer GX-E gives users the basic functionality needed to establish an entry-level predictive maintenance program. Equipped with easy-to-use Basic Vibration Analysis System software, the GX-E supports single-channel, route-based data collection and fundamental analysis tasks.

The GX-E’s ease of use and upgradable platform make it an ideal option for small- to medium-sized plants that want to implement a condition-based predictive maintenance program.

Basic Vibration Analysis System Software

- Uploads data and handles tasks of sorting, storing and reviewing measured data
- Use software to configure measurement points, download measurement point set-ups, and manipulate collected data
- Graphically display and generate reports on collected measurement data to analyze machine condition
- Use the alarm detection feature to quickly scan for abnormal machine conditions

Key features:

- Supports single-channel, single route-based collection
- Minimum number of user configuration settings
- Automatically selects optimum data acquisition settings
- Ergonomic design with large color display
- Easy operation function keys
- Factory upgradable

Ordering details

Order no.	Description
CMXA70-E-K-SL-D*	SKF Microlog GX-E bundle includes: CMXA 70 instrument programmed for single-channel route measurement, battery pack, power cable, power adapter/battery charger, USB/power splitter cable, hand strap, accelerometer cable, accelerometer, magnetic base, hard shell carrying case, hand strap, shoulder strap, (2) screen protectors, CD-ROM (with user manuals, utilities, and asset information page), and Basic Vibration Analysis software. One year of Premier Product Support Plan (coverage begins at time of shipment).
WICM263*	SmartStart Training for SKF Microlog GX-E (4 days onsite training, including 5 manuals)

* SmartStart Training is part of the bundled package of goods and services. The SKF Microlog GX-E (CMXA70-E-K-SL-D) must be ordered in combination with the SmartStart Training for SKF Microlog GX-E (WICM263).

SKF Microlog Analyzer GX-M

"Master-level" unit for 2-channel, route-based data collection

Supporting 2-channel, multi-route, or non-route-based data collection, the SKF Microlog Analyzer GX-M combines high performance and ease of use for a range of predictive maintenance tasks.

The GX-M builds on the same basic functionality of the entry-level GX-E, with the addition of two channel and balancing functionality. This makes the GX-M an ideal choice for plants that have already implemented and wish to expand on a condition-based predictive maintenance program using vibration measurements.

The GX-M can be easily upgraded with additional analysis modules to enhance functionality – without the need to buy another instrument. The GX-M connects seamlessly with SKF @ptitude Analyst software.

SKF @ptitude Analyst software

- Provides fast, efficient, and reliable storage, analysis and retrieval of machine information, and makes it accessible throughout your organization
- Incorporates data from other sources; i.e. OSIsoft PI System, and interfaces with your company's Computerized Maintenance Management System (CMMS); i.e. SAP or Maximo
- Flexible set-up of databases and routes, as well as analysis, reporting and alarm parameters
- Analytical displays, easy-to-read plots, and customizable toolbars all contribute to the user-friendliness of the software
- Alarm View window displays all machines that require immediate attention to help you quickly identify and prioritize corrective actions
- Versatile viewing options permit multi-parameter analysis utilizing the software's many functions

Key features

- Supports single and dual channel route and non-route data collection
- Significant data storage for large and/or multiple route collection and management
- Single and dual plane balancing application
- Phase readings from trigger input and cross-channel
- Ergonomic design with high resolution color display
- Easy operation function keys
- Operates with SKF @ptitude Analyst software
- Field upgradable

Upgrade analysis modules

- Bump test
- Data recorder
- Frequency response function (FRF)*
- Run up Coast down (RUCD)*

** SKF Analysis and Reporting software is required for these modules.*

Ordering details

Order no.	Description
CMXA70-M-K-SL/ CMSW7300D*	SKF Microlog GX-M bundle includes: CMXA 70 instrument programmed for two-channel route measurements and one or two plane static or dynamic couple balancing application, battery pack, power cable, power adapter/battery charger, USB/power splitter cable, (2) accelerometer cables, (2) accelerometers, (2) magnetic bases, rubber bump sleeve, hard shell carrying case, hand strap, shoulder strap, (2) screen protectors, connector cover set with lanyard, CD-ROM (with user manuals, utilities, and asset information page), and SKF @ptitude Analyst for Microlog Software, single client. One year of Premier Product Support Plan for SKF Microlog GX and @ptitude Analyst Software (coverage begins at time of shipment).
WICM263*	SmartStart Training for SKF Microlog GX-M and @ptitude Analyst Software (4 days onsite training, including 5 manuals).

* SmartStart Training is part of the bundled package of goods and services. The SKF Microlog GX-M (CMXA70-M-K-SL/CMSW7300D) must be ordered in combination with the SmartStart Training for SKF Microlog GX-M (WICM263).

SKF Microlog Analyzer AX-M

Flexible, 4-channel performance has never looked better

Featuring a large, easy-to-read color display, the SKF Microlog AX-M takes route-based data collection and stand-alone analysis to a new level. As the latest, most advanced addition to the SKF Microlog Analyzer Series, the AX-M offers four input channels for a wide range of data collection including traditional readings from individual transducers, triaxial accelerometer support, and simultaneous collection of up to four separate inputs.

Users can select analysis modules to create a custom device suited to their requirements. Advanced capabilities include impact natural frequency testing, digital data recording, modal and operating deflection shape FRF measurements, transient analysis, and quality/acceptance testing.

The AX-M connects seamlessly with SKF @ptitude Analyst software.

SKF @ptitude Analyst software

- Provides fast, efficient, and reliable storage, analysis and retrieval of machine information, and makes it accessible throughout your organization
- Incorporates data from other sources; i.e. OSIsoft PI System, and interfaces with your company's Computerized Maintenance Management System (CMMS); i.e. SAP or Maximo
- Flexible set-up of databases and routes, as well as analysis, reporting and alarm parameters
- Analytical displays, easy-to-read plots, and customizable toolbars all contribute to the user-friendliness of the software
- Alarm View window displays all machines that require immediate attention to help you quickly identify and prioritize corrective actions
- Versatile viewing options permit multi-parameter analysis utilizing the software's many functions

Key features

- Simultaneous collection of up to 4 input channels
- Supports single channel measurements, multiple channels for balancing, orbit analysis, and connections to permanently installed transducers, and triaxial accelerometer collection
- Large 6.4 in. VGA color display for easy viewing and analysis in any light
- 806 MHz Xscale processor means faster real time rate and display updates
- Rechargeable lithium battery supports over 8 hours of continuous data collection
- Modular, flexible analysis functionality
- Field upgradable

Upgrade analysis modules

- Bump test
- Data recorder
- Frequency response function (FRF)*
- Run up Coast down (RUCD)*
- Conformance Check

** SKF Analysis and Reporting software is required for these modules.*

Ordering details

Order no.	Description
CMXA80-M-K-SL/ CMSW7300D*	SKF Microlog AX-M bundle includes: CMXA 80 instrument programmed for 4-channel off-route/2-channel route or triaxial route, and balancing modules, USB/power splitter cable, USB/A to B cable, docking station, battery pack, power cable, power adapter/battery charger, (2) accelerometers, (2) accelerometer cables, (2) magnetic bases, hard shell carrying case, soft case, (2) hand straps, shoulder strap, (2) screen protectors, Fischer connector dust cover set, SD card slot and dock connector cover with 1 GB SD Card, CD-ROM (with user manuals, utilities, and asset information page), and SKF @ptitude Analyst for SKF Microlog Software, single client. One year of Premier Product Support Plan for SKF Microlog AX-M and SKF @ptitude Analyst Software (coverage begins at time of shipment).
WICM264*	SmartStart Training for SKF Microlog AX-M and SKF @ptitude Analyst Software (4 days onsite training, including 5 manuals).

* SmartStart Training is part of the bundled package of goods and services. SKF The Microlog AX-M (CMXA80-M-K-SL/CMSW7300) must be ordered in combination with the SmartStart Training for SKF Microlog AX-M (WICM264).

Analysis modules and Product Support Plan

Conformance check module

The conformance check functionality transforms the Microlog into a tool for everyday inspection after delivery, installation, or repair of machinery. An automated assessment compares vibration levels with established limits and a pass or fail indication is displayed to check that the product complies with predefined quality indicators or requirements.

Bump test module

A bump or rap test is an impact test carried out to excite the machine and measure its natural frequencies. This helps to determine if resonance is responsible for high noise or vibration levels or if there is a potential machinery problem.

Data recorder module

Signals from sensors connected to the Microlog are digitally recorded and stored as standard time waveform (WAV) files. These files can be sent via e-mail or transferred to a computer for post processing in external software.

Run up Coast down module

This module records and analyzes data from machines where noise or vibration levels are changing with speed, time or load to establish the critical/resonant speeds of a machine. The module simultaneously acquires a noise or a vibration signal plus a tachometer signal and stores the data as a time waveform (WAV) file for further analysis.

Frequency response function module

This module has two primary functions:

- Establishes the properties of mechanical structures (mass, stiffness and damping) by performing modal analysis using a calibrated hammer for the excitation
- Measure and displays the transfer function (ratio) between two accelerometers while a machine is running. Measurements can be exported to external software to calculate and animate the Operating Deflection Shapes

Balancing module

This module allows precision balancing of rotating machinery across a wide range of speeds. It performs single-plane, two-plane, and static-couple balancing with high precision. Clear, comprehensive setup menus and easy-to-follow display screens with graphical data representation allow easy operation.

FFT analyzer

The module allows you to quickly set up spectral/phase measurements and immediately collect the data for in-the-field FFT spectrum and phase analysis purposes. After collection, the data may be stored in the Microlog for future review and can be transferred to a computer for additional analysis, reporting or storage.

Premier Product Support Plan

Protecting your technology investment

SKF is committed to providing the best customer and product support in the industry. Our goal is to help you get the greatest return on your investment by assisting you in extending the life of your product and facilitating the success of your reliability program.

The one-year Premier Product Support Plan includes:

- Free upgrades of all major firmware and software releases
- Unlimited access to technical support through telephone and e-mail
- Annual preventive maintenance keeps your equipment running optimally, helping ensure the reliability of your data collection and extending the life of your products
- Convenient repair process reduces paperwork and allows for quick return of equipment with loaner units guaranteed
- Proactive notification of maintenance releases
- Calibration of your SKF Microlog Analyzer as often as your company standards require
- One-year subscription to SKF @ptitude Exchange knowledge web portal, that offers hundreds of white papers, tutorials and interactive services

For more information on analysis modules and Product Support Plans, please contact your SKF Authorized Distributor or your local SKF Representative.

Technical data

SKF Microlog MX, GX and AX (page 32–35)

Feature	MX	GX-E	GX-M	AX
Frequency range	40 kHz – 2 channels	20 kHz – single channel	40 kHz – 2 channels	80 kHz for 1 or 2 channels, 40 kHz for 3 or 4 channels
Certifications	Zone 2, CSA Class I Div 2 (NI)	CSA Class I Div 2 (NI)	Zone 2, CSA Class I Div 2 (NI)	CSA Class I Div 2 (NI)
Size	186 x 93 mm *(7.44 x 3.72 in)* narrowest point	186 x 93 mm *(7.44 x 3.72 in)* narrowest point	186 x 93 mm *(7.44 x 3.72 in)* narrowest point	220 x 220 x 71 mm *(8.66 x 8.66 x 2.80 in.)*
	186 x 134 *(7.44 x 5.36 in)* widest point	186 x 134 *(7.44 x 5.36 in)* widest point	186 x 134 *(7.44 x 5.36 in)* widest point	
Weight	715 g *(1.6 lbs)*	715 g *(1.6 lbs)*	715 g *(1.6 lbs)*	1,54 kg *(3,.4 lbs.)*
Display type	Transflective Color LCD 64K Colors	Transflective Color LCD 64K Colors	Transflective Color LCD 64K Colors	TFT VGA backlit color LCD 256K Colors
Host software	Analysis and Reporting Module	Basic Vibration Analyst Software	SKF @ptitude Analyst	SKF @ptitude Analyst
Display size	72 x 54 mm *(2.83 x 2.13 in.)*	72 x 54 mm *(2.83 x 2.13 in.)*	72 x 54 mm *(2.83 x 2.13 in.)*	131 x 98 mm *(5.16 x 3.86 in.)*
Display resolution pixels	240 x 320 (1/4 VGA)	240 x 320 (1/4 VGA)	240 x 320 (1/4 VGA)	640 x 480 resolution
LEDs	Green, Amber, Red	Green, Amber, Red	Green, Amber, Red	Blue, Green, Amber, Red
Connectors	Fischer, Type 103	Fischer, Type 103	Fischer, Type 103	Fischer, Type 103 and 102
Number of simultaneous channels	2	1	2 route and non-route	3 route, 4 non-route
Ingress protection rating	IP65	IP65	IP65	IP65
Drop test	2 meters, Mil-Std 810E	2 meters, Mil-Std 810E	2 meters, Mil-Std 810E	1,2 meters, Mil-Std 810E
Operating temperature	–10 to +50 °C *(+14 to +122 °F)*	–10 to +50 °C *(+14 to +122 °F)*	–10 to +50 °C *(+14 to +122 °F)*	–10 to +60 °C *(+14 to +140 °F)*
Storage temperature	–20 to +60 °C *(–4 to +140 °F)*	–20 to +60 °C *(–4 to +140 °F)*	–20 to +60 °C *(–4 to +140 °F)*	–20 to +60 °C *(–4 to +140 °F)*
Data storage memory internal	64 MB (up to 4 GB SD card)	64 MB (up to 4 GB SD card)	64 MB (up to 4 GB SD card)	128 MB DDR SDRAM 128 MB NAND Flash
Battery technology	Li-ion 2 200 mAh	Li-ion 2 200 mAh	Li-ion 2 200 mAh	Li-ion 6 600 mAh with integral gas gauging
Battery capacity/ life (hours)	2 200 mAh/8 h	2 200 mAh/8 h	2 200 mAh/8 h	6 600 mAh/ 8 h continuous
Processor type	Intel 400 MHz	Intel 400 MHz	Intel 400 MHz	Marvell 806 MHz PXA320
DSP technology	Motorola 80 MHz	Motorola 80 MHz	Motorola 80 MHz	Freescale DSP56311
Operating system	CE.Net v4.2	CE.Net	CE.Net	Windows Embedded CE 6.0

User interface	MX	GX-E	GX-M	AX
Full hierarchy display	N/A	No	Yes	Yes
Missed point indication	Yes	No	Yes	Yes
Multiple measurement storage/historical data	N/A	No	Yes	Yes
Multiple historical data review (waterfall)	Yes	No	Yes	Yes
Type-in text notes	N/A	No	Yes	Yes
Overall bar	No	No	Yes	Yes

Fault detection and sensors

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SKF Copperhead Fault Detection System
CPHD kits

Fault detection systems for mining, mineral processing and cement

Unplanned production shutdowns caused by faults in mining and cement machinery always cost more, in both time and money, than planned shutdowns for maintenance and repair. With SKF Copperhead Fault Detection Systems, machinery faults can be detected before an unplanned shutdown occurs.

Using the latest vibration and temperature measurement techniques to monitor equipment, SKF Copperhead systems detect faults such as loose components, unbalance, gear and bearing damage, lack of lubrication, and high temperatures. The systems feature rugged sensors developed for the harsh mining, mineral processing and cement industries.

These pre-engineered and easy-to-install systems can be used for periodic monitoring, stand-alone continuous monitoring, or integrated into a plant/mine process automation system.

SKF Copperhead becomes part of the plant/mine process automation system when the continuous fault detection capabilities are used. It can also be used in a predictive maintenance program when the sensors are connected with a portable data collector.

SKF Copperhead systems enable plant/mine operators and maintenance to:

- Avoid unplanned downtime
- Reduce maintenance and repair costs
- Detect process faults (machinery function, pump cavitation)
- Improve productivity
- Reduce safety hazards (rotating, height and machinery repairs)

Applications

- Agglomeration drums
- Conveyors
- Crushers
- Kilns
- Roller presses
- Horizontal and vertical mills
- Vibrating screen
- Fans
- Gearboxes
- Motors
- Pumps

Made-to-order kits

SKF Copperhead Fault Detection Systems are supplied as made-to-order kits including rugged sensors, enclosures for periodic or continuous monitoring, vibration and temperature transmitters, and display/alarm modules.

The kits can be supplied with sensors with alternative cable lengths, stainless steel enclosures, and high temperature sensors (up to 200 °C/390 °F) for higher temperature grinding and process machinery applications.

Mining, mineral processing and cement machines come in many different configurations; therefore, each application needs to be evaluated to determine the best combination of components for the system kit.

Contact your SKF representative for assistance when selecting your SKF Copperhead Fault Detection System kit.

Sensors

For normal or very low speed (<40 rpm) applications

- Normal speed sensors (CMPT 2310 and CMPT 2310T) have 100 mV/g vibration sensitivity
- Low speed sensors (CMPT 2323 and CMPT 2323T) have a higher 230 mV/g vibration sensitivity
- Available for monitoring both acceleration and temperature
- Rugged, low profile construction standard with an integral 5m *(16 ft.)* armored cable

Display/alarm module

CMPT DCL

The display/alarm module is used to provide stand-alone monitoring of the signals from the vibration and temperature transmitter (CMPT CTU).

The display/alarm module has a front panel digital display and alarm function, including programmable alarm settings, a front panel alarm lamp, and relay contacts.

One display/alarm module is needed per vibration and temperature signal.

Enclosures

"B" Type

For periodic monitoring

"B" type enclosures are non-metallic with snap latches with BNC type terminals inside for periodic connection with portable vibration and temperature data collectors such as the SKF Microlog Analyzer or equivalent.

The kit provides permanent mounted sensors for a safe, reliable and repeatable periodic predictive maintenance program.

"E" Type

For continuous monitoring

"E" type enclosures are steel with a hinged window door that includes the vibration and temperature transmitter (CMPT CTU) for continuous monitoring.

These enclosures can be connected directly to the plant/mine automation system, or can provide stand-alone vibration and temperature monitoring when the enclosure includes the display/alarm module (CMPT DCL).

All "E" type enclosures come standard with a universal voltage/ frequency power convertor and are pre-wired for easy installation.

Transmitter

CMPT CTU

For vibration and temperature

The transmitter powers the sensor and provides a vibration and temperature analog signal which is processed using one of three user configurable techniques: SKF enveloped acceleration, acceleration or velocity.

- SKF enveloped acceleration vibration analysis is used to identify repetitive impact type vibrations generated by machinery faults due to loose components, gear and bearing faults, and lack of lubrication

- Acceleration vibration analysis is used to monitor overall machine and structural vibration
- Velocity vibration analysis is used to identify looseness, misalignment and unbalance

The transmitter has an optional special 10 second decay feature for monitoring large, low rotational speed machines. When used with the low speed/higher sensitivity sensors, it becomes a very effective fault detection system for roller presses, vertical grinding mills, kilns, agglomeration drums, and more.

continued on next page

Ordering details

Order no.	No. of sensors	Enclosure configuration*	Alternative sensors Standard sensor is **CMPT 2310T**	Alternative sensor cable length Standard cable length 5 m, check with SKF
CPHD	1 2 3 4	B Enclosure with BNC terminals for periodic vibration and temperature monitoring EC Enclosure with CMPT CTU transmitter for monitoring by plant automation. Included power converter and terminals. One CMPT CTU per sensor ECV Enclosure with CMPT CTU transmitter for monitoring by plant automation. Plus additional CMPT CTU transmitter set to Velocity ECM Enclosure with CMPT CTU transmitter and CMPT CTU display/monitor for stand-alone monitoring of vibration. Included power converter and terminals ECMT Enclosure with CMPT CTU transmitter and CMPT CTU for stand-alone monitoring of vibrating and temperature. Included power converter and terminals.	/10 CMPT 2310 vibration (100 mV/g) sensor /23T CMPT 2323 vibration (230 mV/g) and temperature sensor /23 CMPT 2323 vibration (230 mV/g) sensor	x 10 Sensors with 10 m integral cable length x 15 Sensors with 15 m integral cable length

* Enclosures are standard with CMPT 2310T sensors unless designated with an alternative sensor suffix.

Ordering examples

A kit with (2) **CMPT 2310T** sensors (standard with 5 m cable), (1) BNC enclosure, with (2) BNC connectors per vibration and temperature sensor would be SKF Order no. **CPHD 2B.**

A kit with (3) **CMPT 2310T** sensors, (1) Enclosure with (3) **CMPT CTU** transmitters (one per sensor) would be SKF Order no. **CPHD 3EC.**

A kit with (4) **CMPT 2310T** sensors, (1) Enclosure with (4) **CMPT CTU** transmitters (one per sensor) plus (1) **CMPT CTU set to velocity** would be SKF Order no. **CPHD 4ECV.**

A kit with (5) **CMPT 2323T x 10** sensors (10 m cable length), (1) Enclosure with (5) **CMPT CTU** transmitters (one per sensor), (5) **CMPT DCL display/alarm modules to monitor vibration, (5) CMPT DCL display/alarm modules to monitor temperature** would be SKF Order no. **CPHD 5ECMT/23T x 10.**

Loop-powered vibration transmitters series CMSS 420VT

An economical approach to continuous vibration monitoring

- Continuous 24/7 vibration signal output
- Continuously monitors machine health with integrated sensor
- Built in accelerometer and electronics to process vibration signal
- Sends signal back along 24 volt power line that supplies its power
- Transmits directly to a Programmable Logic Controller (PLC) or Distributed Control System (DCS) for trending, alarm, and eventual machine shutdown
- Standard 4 to 20 mA output that is proportional to overall vibration in terms of velocity
- Dynamic signal output for portable analyzers
- Simple installation with available adapters
- Accessories available to display the reading and provide connector for SKF Microlog
- CE Approved
- Approved Class 1, Division 2, Groups B, C, D for US and Canada

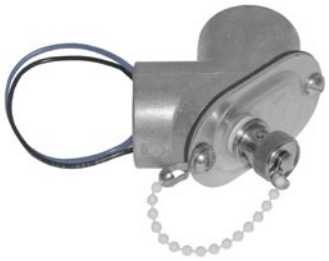
Accessories

Display retrofit (requires transmitter)
CMSS 420LCD/CMSS 420LED

- LCD displays actual vibration levels in velocity on a Liquid Crystal Display
- LED displays actual vibration levels in velocity on a Light Emitting Diode display
- Displays are shipped loose, and installation is simple
- Includes BNC connector that provides access to the raw acceleration signal from the CMSS 420VT

BNC adapter retrofit
CMSS 420BNC

- 90 degree 19 mm *(0.75 in.)* NPT conduit elbow with a BNC connector to access the raw acceleration signal
- Useful for connecting the CMSS 420VT to the portable data collectors



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Weatherproof cable fitting
CMSS 420WF

- 19 mm *(0.75 in.)* NPT
- Provides simple weatherproof exit for instrument wire when used with the CMSS 420EL

Elbow
CMSS 420EL

- 90 degree, 19 by 19 mm *(0.75 by 0.75 in.)* NPT
- Useful for connecting CMSS 420VT to hard or flexible conduit
- Provides simple weatherproof exit for instrument wire when used with the CMSS 420WF

Pipe thread accelerometer mounting adapter
CMSS 203

- Provided in several NPT sizes to accommodate the most common plugs found on most machinery
- Adapters have a 1/4-28 threaded hole to mate with the CMSS 420VT and most common accelerometers and vibration transmitters

Ordering details

Order no.	Description
CMSS 420VT-1	25,4 mm/s (0 to 1 in./s) RMS, includes 1/4-28 and M8 mounting studs
CMSS 420VT-2	50,8 mm/s (0 to 2 in./s) RMS, includes 1/4-28 and M8 mounting studs

Accessories

Order no.	Description
CMSS 420LCD-01	Display retrofit – Liquid Crystal Display (LCD) 0 to 1 in./s
CMSS 420LCD-02	Display retrofit – Liquid Crystal Display (LCD) 0 to 2 in./s
CMSS 420LCD-51	Display retrofit – Liquid Crystal Display (LCD) 25,4 mm/s
CMSS 420LCD-52	Display retrofit – Liquid Crystal Display (LCD) 50,8 mm/s
CMSS 420LED-01	Display retrofit – Light Emitting Diode display (LED) 0 to 1 in./s
CMSS 420LED-02	Display retrofit – Light Emitting Diode display (LED) 0 to 2 in./s
CMSS 420LED-51	Display retrofit – Light Emitting Diode display (LED) 25,4 mm/s
CMSS 420LED-52	Display retrofit – Light Emitting Diode display (LED) 50,8 mm/s
CMSS 420BNC	90 degree, 19 mm *(0.75 in.)* BNC adapter retrofit
CMSS 420WF	NPT Weatherproof cable fitting
CMSS 420EL	90 degree, 19 by 19 mm *(0.75 by 0.75 in.)* NPT Elbow
CMSS 203-01	12,7 mm *(0.5 in.)* NPT Pipe thread accelerometer mounting adapter
CMSS 203-02	19 mm *(0.75 in.)* NPT Pipe thread accelerometer mounting adapter
CMSS 203-03	3/8 in. NPT Pipe thread accelerometer mounting adapter
CMSS 203-04	6,35 mm *(0.25 in.)* NPT Pipe thread accelerometer mounting adapter

General purpose industrial accelerometers
CMSS 2100/2200

Rugged, economic vibration sensors for a wide variety of industrial applications

Using knowledge acquired from many years of supplying high quality sensors to a broad spectrum of industry users, SKF offers rugged accelerometers designed for the pulp and paper, petrochemical, steel, mining, construction, metal working, and machine tool industries.

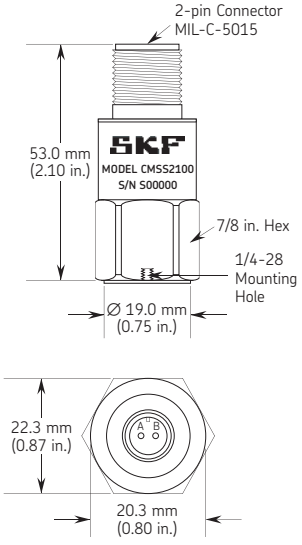
Accelerometers sense vibration commonly found in most industrial machinery. Applications for acceleration and velocity sensors include machinery health monitoring of motors, fans, pumps, gearboxes, blowers, machine tool spindles, compressors, chillers, rollers, and mixers.

Maintenance professionals use accelerometers for predictive maintenance to lower overall cost and increase machinery performance.

- Incorporates the latest technologies to meet the demanding CE, EMC, and low noise level requirements
- For use with SKF junction boxes, on-line systems, protection systems and the portable data collection instruments
- Rugged, economical, and all around general purpose sensor
- Sensitivity, 100 mV/g to optimize use in multiple applications
- Exceptional bias voltage (BV) stability at elevated temperatures
- Designed for exceptionally low noise levels for low frequencies at elevated temperatures
- Corrosion resistant and hermetically sealed for humid areas
- Smaller profile
- Two (2) mounting studs (1/4-28 and M8 x 1.25) provided
- Reverse polarity wiring protection

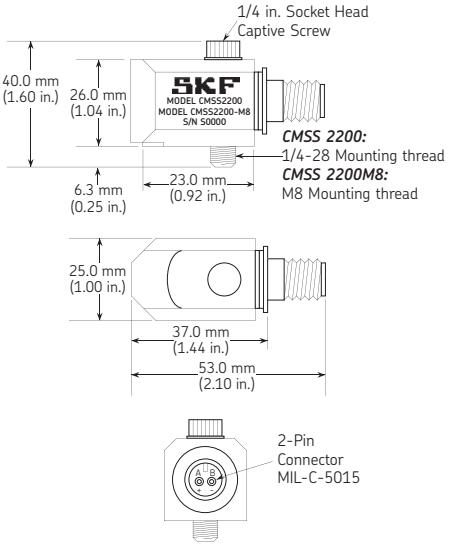
General purpose, top exit, industrial accelerometer *CMSS 2100*

Industrial accelerometer with top exit MIL-C-5015 two (2) pin connector.



General purpose, low profile, side exit, industrial accelerometer *CMSS 2200/CMSS 2200-M8*

Industrial accelerometer with side exit two pin connector offers a low profile for machinery with limited clearance. Mounts in any orientation.



Ordering details

Order no.	Description
CMSS 2100	General purpose industrial accelerometer with top exit MIL-C-5015 two (2) pin connector. 1/4-28 and M8 mounting studs provided. Calibration sensitivity and nominal sensitivity is provided for each accelerometer package.
CMSS 2200	General purpose low profile industrial accelerometer with side exit MIL-C-5015 two (2) pin connector. 1/4-28 and M6 mounting studs provided. Calibration sensitivity and nominal sensitivity is provided for each accelerometer package.
CMSS 2200-M8	General purpose low profile industrial accelerometer with side exit MIL-C-5015 two (2) pin connector. M8 mounting stud provided.

Eddy probe systems
RYTON-based eddy current transducers

Eddy probe systems

The Eddy probe system is a field proven method for reliably detecting various machine displacement parameters. The probe's simplicity and rugged design enables it to withstand the temperatures and chemicals typically encountered in harsh machine environments.

Eddy probes measure radial or axial shaft motion. They are mounted through or to the side of a bearing cap and observe the shaft's movement relative to its mounting position.

An Eddy probe system is comprised of a probe, a driver (oscillator demodulator), and an extension cable.

Eddy probe systems have excellent frequency response. They have no lower frequency limit and are used to measure shaft axial position as well as vibration.

- Conforms to API 670 – American Petroleum Institute has published Standard 670 to define reliable protection systems for rotating equipment operating in the harsh conditions found in oil production, refining, and chemical processing
- Super tough RYTON probe tips and driver case – RYTON's strength approaches that of metal. The material is now beginning to be used in the manufacture of automobile engines
- DIN rail mounting and compression connectors are used for optimum installation
- Hazardous area approved units are available
- Available with standard removable/reversible connector or the optional permanent fixed connector

Note: Eddy probe, displacement probe, and proximity probe are all synonyms for the same or similar products manufactured and supplied by various companies.

Selecting an Eddy probe system

A wide variety of SKF systems are offered to meet the requirements of virtually any application.

Probe range is limited largely by the probe's diameter. The standard SKF probe diameters are 5 mm (CMSS 65), and 8 mm (CMSS 68).

The following should be considered when selecting a system:

Range

The gap over which the system must accurately operate.

Sensitivity

Must be compatible with monitors or other companion instruments.

System length

The physical length of the systems is approximate to the electrical length. Excess cable in certain installations is typically coiled and tied with no harmful effects.

Probe case

The size of the probe mounting case may be a factor in some installations. Several case options are available. Please see ordering information.

Hazardous area approvals North America

Approvals granted by Factory Mutual (FM) and Canadian Standards Association (CSA).

Class 1 Division 1 Groups A, B, C, D

Intrinsically safe when used with zener barriers or galvanic isolators.

Class 1 Division 2 Groups A, B, C, D

When connected with National Electric Code (NEC) without zener barriers or galvanic isolator.

See ordering details for probe and driver designations for hazardous area approved models.

Contact your local SKF Reliability Systems sales representative for details.

For complete details on the product range, please see:
Publication CM2004 EN,
SKF Eddy Probe Systems catalog.

5 mm Eddy probe system RYTON-based eddy current transducers
CMSS 65/CMSS 665 Series

8 mm Eddy probe system RYTON-based eddy current transducers
CMSS 68/CMSS 668 Series

Standard Eddy probe systems

System	Usable range	Sensitivity	System length	Standard case	Description
CMSS 65/CMSS 665	80 mil	200 mV/mil	5 m	1/4-28	Standard system
CMSS 68/CMSS 668	90 mil	200 mV/mil	5 m	3/8-24	Meets intent of API 670
CMSS 68/CMSS 668-1	90 mil	200 mV/mil	10 m	3/8-24	Long system length
CMSS 68/CMSS 668-2	90 mil	200 mV/mil	15 m	3/8-24	Long system length
CMSS 68/CMSS 668-5	15–160 mil	100 mV/mil	10 m	3/8-24	Long range

continued on next page

5 mm Eddy probe system
RYTON-based eddy current transducers
CMSS 65/CMSS 665 Series

Eddy current probe

Ordering details

Order no.	Description
CMSS 65-002-00-12-10	SKF standard Eddy current probe See ordering matrix below to build your order number if requirements are different from SKF standard Eddy current probe

CMSS 65 □□□ — □□ — □□ — □□

CABLE	
Standard	00
Armored	01
Fiberglass sleeved	02
CSA/FM/SIRA (ATEX) (Intrinsically Safe) Certified	07
CSA/FM/SIRA (ATEX) (Intrinsically Safe) Certified and Armored	08
FM (non-incendive)	09
FM (non-incendive) Armored	0B

CASE	
2	1/4-28 threads (standard)
3	M8 x 1 threads
0	3/8-24 threads
1	M10 x 1 threads
4	No case
E	Button probe (Fiberglass)

A* – UNTHREADED CASE LENGTH	
Fully threaded	00
0.1 inches to 5.0 inches (Unthreaded)	01 to 50
5.1 inches to 9.9 inches	51 to 99
Reverse mount, 3/8-24 threads	RM

B* – CASE LENGTH	
Standards:	
No case	00
0.8 inches	08
1.2 inches	12
1.5 inches	15
2.0 inches	20
2.5 inches	25
3.0 inches	30
4.0 inches	40
4.7 inches	47
6.0 inches	60
9.0 inches	90
Specials:	
0.9 to 5.9 inches	09 to 59
9.1 to 9.9 inches	91 to 99

C* – OVERALL LENGTH +1	
05	0.5 meters
10	1.0 meter (standard)
5A	5.0 meters

+1: Length is **Nominal Electrical**: Physical length may vary.

The 5A units have integral cable and mate directly to the Driver.

*Product dimensions shown on page 49

Extension cable

Ordering details

Order no.	Description
CMSS 958-00-040	SKF standardextension cable See ordering matrix below to build your order number if requirements are different from SKF Standard Extension Cable

CMSS 958 □□ — □□□

CABLE	
Standard	00
Armored	01
Fiberglass sleeved	02
CSA/FM/SIRA (ATEX) (Intrinsically Safe) Certified	09
CSA/FM/SIRA (ATEX) (Intrinsically Safe) Certified and Armored	0A
FM (non-incendive)	0H
FM (non-incendive) Armored	0J

LENGTH (Compatible system listed)	
CMSS 665, 2.0 meters CMSS 65	030
CMSS 665, 1.0 meter CMSS 65	040
CMSS 665, 0.5 meters CMSS 65	045

System ordering example for CMSS 65

Probe: ***CMSS 65-092-05-25-05***
5 mm tip diameter, 0.25 in.-28 thread, 2,5 in. case length, 0,5 in. unthreaded case length, 0,5 meter cable, no armor, Class 1 Division 2 certified

Extension Cable: ***CMSS 958-0H-045***
Extension Cable, no armor, 4,5 meter length, Class 1 Division 2 certified

Driver: ***CMSS 665-20-00***
Driver, FM (non-incendive), 5 meter system

Eddy probe systems in general are electronically-matched systems, and it is not possible to interchange components between systems from different manufacturers. If replacing another manufacturer's component, it is necessary to order a complete system, including probe, cable and driver.

Driver

Driver for 5 meter system
CMSS 665/CMSS 665P

Use with these combination of components:

- 1 meter Probe and 4 meter Extension Cable
- 0,5 meter Probe and 4,5 meter Extension Cable
- or 5 meter Probe

Driver for 10 meter system
CMSS 665-1/CMSS 665P-1

Use with these combination of components:

- 1 meter Probe and 9 meter Extension Cable
- or 10 meter Probe

Driver for enhanced environmental protection
CMSS 665-8/CMSS 665P-8

Specifications same as standard driver; however, it is also filled with potting material to provide additional measure of protection when operated in adverse environmental conditions.

Driver for hazardous area approval Class 1 Division 1 Groups A, B, C, D
CMSS 665-16-9/CMSS 665P-16-9

- CSA/FM/SIRA (Intrinsically Safe) Certified Driver for 5 meter System

  Example: Use with CSA/FM/SIRA (Intrinsically Safe) Certified 1 meter CMSS 65 Probe and 4 meter CMSS 958 Extension Cable
- For intrinsic safety installations, drivers must be installed with barriers as specified in CSA/FM/SIRA certification and associated documentation

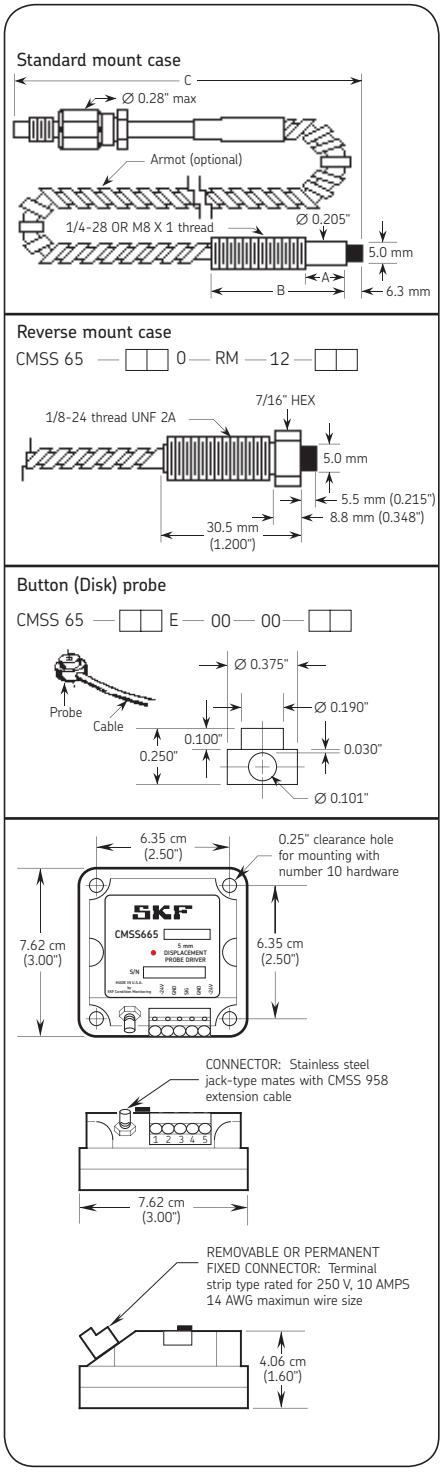
Driver for hazardous area approval
CMSS 665-20-00/CMSS 665P-20-00

- FM (non-incendive) Certified Driver for the 5 meter System

  Example: Use with FM (non-incendive) Certified 1 meter CMSS 65 Probe and CMSS 958 Extension Cable

Note: All circuit boards used in SKF CMSS 665 Series Drivers are conformal coated as standard procedure.

Product dimensions



Ordering details

Order no.	Description
CMSS 665/CMSS 665P	Driver for 5 meter system
CMSS 665-1/CMSS 665P-1	Driver for 10 meter system
CMSS 665-8/CMSS 665P-8	Driver for enhanced environmental protection
CMSS 665-16-9/CMSS 665P-16-9	Driver for hazardous area approval (Intrinsic Safety)
CMSS 665-20-00/CMSS 665P-20-00	Driver for hazardous area approval (non-incendive)

Drivers containing the "P" in the model number, denote those models with permanent fixed connector.

continued on next page

8 mm Eddy probe system

RYTON-based eddy current transducers

CMSS 68/CMSS 668 Series

Eddy current probe

Ordering details

Order no.	Description
CMSS 68-002-00-12-10	SKF standard Eddy current probe See ordering matrix below to build your order number if requirements are different from SKF standard Eddy current probe

CMSS 68 — [ ][ ][ ] — [ ][ ] — [ ][ ] — [ ][ ]

CABLE	
Standard	00
Armored	01
Fiberglass sleeved	02
CSA/FM/SIRA (ATEX) (Intrinsically Safe) Certified	07
CSA/FM/SIRA (ATEX) (Intrinsically Safe) Certified and Armored	08
FM (non-incendive)	09
FM (non-incendive) Armored	0B

CASE	
0	3/8-24 threads (Standard)
1	M10 x 1 threads
4	No case
E	Button probe (Fiberglass)

A* – UNTHREADED CASE LENGTH	
Fully threaded	00
0.1 inches to 5.0 inches (Unthreaded)	01 to 50
5.1 inches to 9.9 inches	51 to 99
Reverse mount, 3/8-24 threads	RM

B* – CASE LENGTH	
Standards:	
No case	00
0.8 inches	08
1.2 inches	12
1.5 inches	15
2.0 inches	20
2.5 inches	25
3.0 inches	30
4.0 inches	40
4.7 inches	47
6.0 inches	60
9.0 inches	90
Specials:	
0.9 to 5.9 inches	09 to 59
9.1 to 9.9 inches	91 to 99

*Product dimensions shown on page 51

C* – OVERALL LENGTH +1	
05	0.5 meters
10	1.0 meter (standard)
5A	5.0 meters
AA	10.0 meters
FA	15.0 meters

+1: Length is **Nominal Electrical**: Physical length may vary.

The 5A, AA, FA units have integral cable and mate directly to the Driver.

Extension Cable

Ordering details

Order no.	Description
CMSS 958-00-040	SKF Standard Extension Cable See ordering matrix below to build your order number if requirements are different from SKF Standard Extension Cable

CMSS 958 — [ ][ ] — [ ][ ][ ]

CABLE	
Standard	00
Armored	01
Fiberglass sleeved	02
CSA/FM/SIRA (ATEX) (Intrinsically Safe) Certified	09
CSA/FM/SIRA (ATEX) (Intrinsically Safe) Certified and Armored	0A
FM (non-incendive)	0H
FM (non-incendive) Armored	0J

LENGTH (Compatible system listed)	
CMSS 668, 1.0 meter CMSS 68	040
CMSS 668, 0.5 meters CMSS 68	045
CMSS 668-1, 1.0 meter CMSS 68	090
CMSS 668-1, 0.5 meters CMSS 68	095
CMSS 668-2, 1.0 meter CMSS 68	140

System ordering example for CMSS 68

Probe: ***CMSS 68-000-RM-12-10***
8mm tip diameter, 3/8 in.-24 thread, 1,2 in. case length, reverse mount, 1,0 meter cable, no armor, no hazardous area certification

Extension Cable: ***CMSS 958-00-090***
Extension Cable, no armor, 9,0 meter length, no hazardous area certification

Driver: ***CMSS 668-1***
Driver, 10 meter system, no hazardous area certification

Eddy probe systems in general are electronically-matched systems, and it is not possible to interchange components between systems from different manufacturers. If replacing another manufacturer's component, it is necessary to order a complete system, including probe, cable and driver.

Drivers

Driver for 5 meter system
CMSS 668/CMSS 668P

Use with these combination of components:

- 1 meter Probe and 4 meter Extension Cable
- 0,5 meter Probe and 4,5 meter Extension Cable
- or 5 meter Probe

Driver for 10 meter system
CMSS 668-1/CMSS 668P-1

Use with these combination of components:

- 1 meter Probe and 9 meter Extension Cable
- or 10 meter Probe

Driver for 15 meter system
CMSS 668-2/CMSS 668P-2

Use with these combination of components:

- 1 meter Probe and 14 meter Extension Cable
- or 15 meter Probe

Driver for extended range
CMSS 668-5/CMSS 668P-5

Use with these combination of components:

- 1 meter Probe and 9 meter Extension Cable
- or 10 meter Probe

Driver for enhanced environmental protection
CMSS 668-8/CMSS 668P-8

Specifications same as standard driver; however, it is also filled with potting material to provide additional measure of protection when operated in adverse environmental conditions.

Driver for hazardous area approval Class 1 Division 1 Groups A, B, C, D
CMSS 668-16-9/CMSS 668P-16-9

- CSA/FM/SIRA (Intrinsically Safe) Certified Driver for 5 meter System

  Example: Use with CSA/FM/SIRA (Intrinsically Safe) Certified 1 meter CMSS 68 Probe and 4 meter CMSS 958 Extension Cable
- For intrinsic safety installations, drivers must be installed with barriers as specified in CSA/FM/SIRA certification and associated documentation

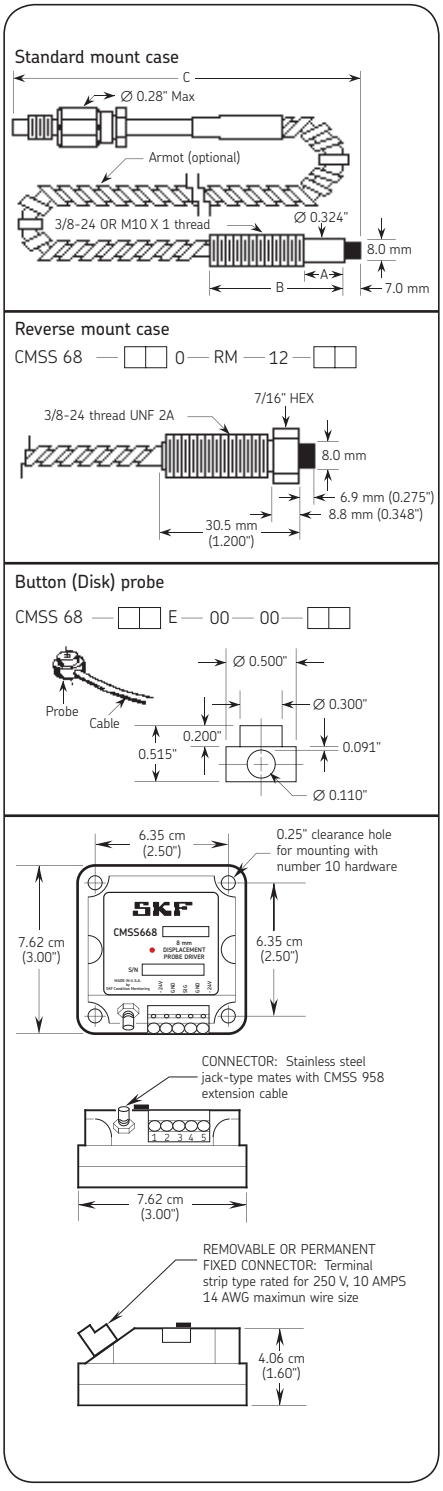
Driver for hazardous area approval Class 1 Division 2 Groups A, B, C, D
CMSS 668-20-00/CMSS 668P-20-00

- FM (non-incendive) Certified Driver for the 5 meter System

  Example: Use with FM (non-incendive) Certified 1 meter CMSS 68 Probe and CMSS 958 Extension Cable

Note: All circuit boards used in SKF CMSS 668 Series Drivers are conformal coated as standard procedure.

Product dimensions



Ordering details

Order no.	Description
CMSS 668/CMSS 668P	Driver for 5 meter system
CMSS 668-1/CMSS 668P-1	Driver for 10 meter system
CMSS 668-2/CMSS 668P-2	Driver for 15 meter system
CMSS 668-5/CMSS 668P-5	Driver for extended range
CMSS 668-8/CMSS 668P-8	Driver for enhanced environmental protection
CMSS 668-16-9/CMSS 668P-16-9	Driver for hazardous area approval (Intrinsic Safety)
CMSS 668-20-00/CMSS 668P-20-00	Driver for hazardous area approval (non-incendive)

Drivers containing the "P" in the model number, denote those models with permanent fixed connector.

Technical data

Copperhead CMPT Sensors (page 41)

Designation	CMPT sensors
Cable	Standard with 5 m *(16 ft.)* integral armored cable
Mounting to machinery	Supplied with M6 and 6,35 mm *(0,25 in.)* socket head screw
Acceleration output range	70 g
Shock limit	5 000 g
Accelerometer measurement temperature range	–50 to +120 °C *(–58 to +248 °F)*

	CMPT 2310	CMPT 2310T	CMPT 2323	CMPT 2323T
Vibration sensitivity	100 mV/g	100 mV/g	230 mV/g	230 mV/g
Temperature	N/A	10 mV/°C	N/A	10 mV/°C

Note: Some sensors are available with 10 m (32 ft.) or 15 m (48 ft.) cables length. Check with SKF for availability.

Copperhead CMPT CTU vibration and temperature transmitter (page 41)

Designation	CMPT CTU
Vibration process analysis	
Acceleration Enveloping	gE3 (ENV3)
Acceleration, g	2 Hz to 20 kHz (RMS and Peak Hold)
Velocity, mm/s (inch/s)	ISO (10 Hz to 1 kHz)
Vibration signal decay	1 or 10 seconds (SKF enveloped acceleration)
Analog output	
Processed vibration	4 to 20 mA and 0 to 10 V DC proportional to full scale vibration
Temperature	4 to 20 mA and 0 to 10 V DC proportional to 0 to +120 °C
Buffered acceleration output	BNC connector, screw terminals
Output averaging option	On/Off

Copperhead CMPT DCL display/alarm module (page 41)

Designation	CMPT DCL
Accepts the following inputs types	
Current	4 to 20 mA, 0 to 20 mA
Voltage	0 to 10 V DC; 0 to 1 V DC; 0 to 5 V DC; 1 to 5 V DC
Thermocouple	K, J, R, S, B, E, T, N, PL-II, C (W/Re5-26)
RTD	Pt100, JPt100 three-wire system
LED display	7,4 mm (height) x 4,0 mm (width)
	Scaleable for vibration (gE, g, mm/s, inch/s), temperature (°C, °F), etc.
Alarm functions	
Type	LED event lamp on front display (red)
One relay contact	48 V DC / AC; 1 A maximum (optional latching or non-latching relay)
Setting	One programmable alarm setting
Output signal	4 to 20 mA proportional to scaled input

Copperhead CPHD enclosures for kits (page 41)

Designation	CPHD enclosures
Description	Painted steel with hinged window door
Dimensions and weight	Dependent on kit type
IP rating	IP66 (NEMA 4)
Required supply voltage	100–250 V AC / 50–60 Hz

Loop-powered vibration transmitters (page 43)

Designation	**CMSS 420VT**
Dynamic	
Output	4 to 20 mA proportional to full scale velocity
Accuracy	±5% of full-scale
Frequency response	2 to 2 000 Hz
Frequency response accuracy	
-3 dB	2 Hz to 2 kHz
10%	10 Hz to 1 kHz
5%	15 Hz to 750 Hz
Buffered output	Acceleration, 100 mV/g
Environmental	
Operating temperature	–20 to +80 °C *(–4 to +176 °F)*
Sealed	Epoxy encapsulated
Enclosure	SS, NEMA 4, 4X, 12
Mounting	Stud mounted
Weight (without display)	227 g *(8 oz.)*
Regulatory approval	
CE Mark	SKF Loop-powered vibration transmitter CMSS 420 VT and displays CMSS 420LCD and CMSS 420LED
Hazardous area ratings	The CMSS 420VT is suitable for use in Class 1, Division 2, Groups B, C, D (US and Canada)
Electrical ratings	22 to 36 V DC, 4 to 23 mA, provided from an external DC source rated 36 V DC maximum, 23 mA maximum. The CMSS 420VT is suitable for use in Class 1, Division 2, Groups B, C, D (US and Canada)
Maximum load	Up to 500 ohms resistive at 24 V DC and no display (See Note – Maximum load resistance calculations for specific requirements)
Grounding	Case isolated

Note: Maximum load resistance calculations:
DC Supply Voltage range: 22 to 36 V DC
$R_{Lmax} = (V_s – 14 – V_d) / 0.02$
R_L *= Load resistance*
V_s *= DC supply voltage*
V_d *= Display voltage: 5.0 V DC for LED, 2.0 V DC for LCD, 0.0 V DC for no display*

The recommended Load Resistance (RL) for most installations is: 100 or 250 Ω at Vs = 24 V DC, with or without an LED/LCD display.

Technical data

Industrial accelerometers (page 45)

Designation	CMSS 2100	CMSS 2200 / CMSS 2200-M8
Dynamic		
Sensitivity	100 mV/g	
Sensitivity precision	±5% at +25 °C *(+77 °F)*	±10% at +25 °C *(+77 °F)*
Acceleration range	80 g peak	
Amplitude linearity	≤1%, up to full scale	1%
Frequency range		
±5%	3,0 to 5 000 Hz	
±10%	1,0 to 9 000 Hz	1,0 to 5 000 Hz
±3 dB	0,5 to 14 000 Hz	0,7 to 10 000 Hz
Resonance frequency	Mounted, nominal 30 kHz	
Transverse sensitivity	≤5% of axial	
Electrical		
Power requirements:		
Voltage source	+24 V DC nominal, 18 to 30 V DC	18 to 30 V DC
Constant current diode	2 to 10 mA DC, recommended 4 mA	
Electrical noise	2.0 Hz; 20 µg/√Hz	
Output impedance	<100 Ω	
Bias output voltage	12 V DC	
Grounding	Case isolated, internal shielding	
Environmental		
Temperature range	–50 to +120 °C *(–58 to +248 °F)*, operating temperature	
Vibration limits	500 g peak	
Shock limit	5 000 g peak	
Electromagnetic sensitivity, equivalent g, maximum	70 µg/gauss	
Sealing	Hermetic	
Base strain sensitivity	200 µg/microstrain	
CE	According to the generic immunity standard for Industrial Environment EN50082-2.	
Acceptance criteria	The generated "false equivalent g level" under the above test conditions should be less than 2 mg peak to peak.	
Physical		
Dimensions	See drawing	
Weight	90 g *(3.2 oz.)*	145 g *(5.1 oz.)*
Case material	316L stainless steel	
Mounting	Internal 1/4-28 thread. Mounting studs provided. One (1) 1/4-28 to 1/4-28 English thread and one (1) M8 x 1,25 metric thread.	Captive mounting bolts provided. One (1) 1/4-28 English thread and one (1) M6 x 1,00 metric thread.
Mounting torque	2,9 Nm *(24 in.lbs)*	3,4 Nm *(30 in.lbf)*
Connector		
Pin A	Signal/Power	
Pin B	Common	
Mating connector	CMSS 3106F-10SL-4S or equivalent	
Recommended cable	Two conductor shielded, teflon jacket, 100 pF/m *(30 pF/ft.)*	

Specifications conform to ISA-RP-37.2 (1 to 64) and are typical values referenced at +24 °C (+75 °F), 24 V DC supply, 4 mA constant current and 100 Hz.

CMSS 65 Eddy Current Probe System (page 48)

Usable range	
Standard	2 mm (0,25 mm to 2,25 mm), 80 mil (10 mil to 90 mil)
With zener barrier (Intrinsic Safety)	1,15 mm (0,25 mm to 1,4 mm) 45 mil (10 mil to 55 mil)
Sensitivity	
Standard	7,87 mV/micron *(200 mV/mil)*
With driver for 10 meter system	7,87 mV/micron *(200 mV/mil)* ±10% of 200 mV/mil
Linearity	
Standard	±25,4 microns *(1 mil)* of best straight line over 2 mm *(80 mil)* range
With driver for 10 meter system	±38 microns *(1,5 mil)* from best straight line
With zener barrier (Intrinsic Safety)	±25,4 microns *(1 mil)* from best straight line over 1,15 mm *(45 mil)* range
Frequency range	DC to 10 kHz; DC to 600 000 CPM; down maximum of 3 dB at 10 kHz
Driver signal output	
Impedance	Minimum calibrated load resistance of 3kΩ; output is protected against miswiring.
Voltage	Nominal 7,87 mV/micron (200 mV/mil) corresponding to –18 V DC at 2,3 mm *(90 mil)* with –24 V DC supply.
Power supply requirements	15 mA from –24 V DC to –30 V DC
Interchangeability	Compliant to API-670, which requires that probes, extension cables and drivers in 5 meter systems be interchanged with ±5% or less performance change without recalibration. A trim calibration adjustment on Driver provides a means for duplication of characteristics after replacement of any component.
Probe	
Operating temperature range	–34 to +177 °C *(–29 to +350 °F)*, Note: Ex i regulations restrict upper limit to +100 °C
Differential pressure	To 4 bar (60 PSI)
Materials	
Case	300 stainless steel
Tip material	RYTON
Connectors	Nickel plated stainless steel; weatherproof, sealable
Cable	Coaxial with Teflon insulation; high tensile and flexible strength
Mounting	Recommend minimum clearance of 1/2 Probe Tip diameter around the Probe Tip to maintain factory calibration
Extension cable	
Temperature ranges, connectors, cable same as CMSS 65 Eddy Current Probe.	
Drivers	
Operating temperature range	0 to +65 °C *(+32 to +149 °F)*
Connections (Power, Signal, GND)	Five terminal removable and reversible compression terminal block accepting up to 2 mm^2 (14 AWG) wire. Three connections necessary per block (–24 V DC; GND; Signal). The CMSS 665P has a permanent fixed connector with same connection characteristics.
Mounting	C-DIN Rail Mount which bolts onto Driver enclosure, or the standard four number 10 clearance holes in a square on 63,5 mm *(2.5 in.)* centers.

Unless otherwise noted, the specifications apply to a complete CMSS 65 Eddy Current Probe System composed of: CMSS 65 Eddy Current Probe, CMSS 958 Extension Cable, and CMSS 665 or CMSS 665P Driver at +23 °C (+73 °F), with a –24 V DC supply and target of AISI 4140 steel.

These specifications may vary with different options and systems.

Technical data

CMSS 68 SKF Eddy Current Probe System (page 50)

Usable range	
Standard	2,3 mm (0,25 mm to 2,5 mm), 90 mil (10 mil to 100 mil)
With driver for extended range	3,6 mm (0,4 mm to 4,0 mm), 145 mil (15 mil to 160 mil)
With zener barrier (Intrinsic Safety)	1,6 mm (0,25 mm to 1,9 mm), 65 mil (10 mil to 75 mil)
Sensitivity	
Standard	7,87 mV/micron (200 mV/mil)
With driver for 10 meter system	7,87 mV/micron (200 mV/mil) ±10% of 200 mV/mil
With driver for 15 meter system	7,87 mV/micron (200 mV/mil) ±10% of 200 mV/mil at +23 °C
With driver for extended range	3,94 mV/ micron (100 mV/mil) ±10% of 100 mV/mil at +23 °C
Linearity	
Standard	±25,4 microns (1 mil) of best straight line over 2,3 mm (90 mil) range
With driver for 10 meter system	±38 microns (1.5 mil) from best straight line
With driver for 15 meter system	±38 microns (1.5 mil) from best straight line over 2,3 mm at +23 °C
With driver for extended range	±25,4 microns (1 mil) from best straight line over 3,6 mm at +23 °C
With zener barrier (Intrinsic Safety)	±25,4 microns (1 mil) from best straight line over 1,15 mm (45 mil) range
Frequency range	DC to 10 kHz; DC to 600 000 CPM; down maximum of 3 dB at 10 kHz
Driver signal output	
Impedance	Minimum calibrated load resistance of 3 k Ω; output is protected against miswiring.
Voltage	Nominal 7,87 mV/micron (200 mV/mil) corresponding to –18 V DC at 2,3 mm (90 mil) with –24 V DC supply.
Power supply requirements	15 mA from –24 V DC to –30 V DC
Interchangeability	Compliant to API-670, which requires that probes, extension cables and drivers in 5 meter systems be interchanged with ±5% or less performance change without recalibration. A trim calibration adjustment on Driver provides a means for duplication of characteristics after replacement of any component.
Probe	
Operating temperature range	–34 to +177 °C *(–29 to +350 °F)*, Note: Ex i regulations restrict upper limit to +100 °C
Differential pressure	To 4 bar (60 PSI)
Materials:	
Case	300 stainless steel
Tip material	RYTON
Connectors	Nickel plated stainless steel; weatherproof, sealable
Cable	Coaxial with Teflon insulation; high tensile and flexible strength.
Mounting	Recommend minimum clearance of 1/2 Probe tip diameter around the Probe tip to maintain factory calibration.
Extension cable	
Temperature ranges, connectors, cable same as CMSS 68 Eddy Current Probe.	
Drivers	
Operating temperature range	0 to +65 °C *(+32 to +149 °F)*
Connections (Power, Signal, GND)	Five terminal removable and reversible compression terminal block accepting up to 2 mm^2 *(14 AWG)* wire. Three connections necessary per block (–24 V DC; GND; Signal). The CMSS 668P has a permanent fixed connector with same connection characteristics.
Mounting	C-DIN Rail Mount which bolts onto Driver enclosure, or the standard four number 10 clearance holes in a square on 63,5 mm *(2.5 in.)* centers.

Unless otherwise noted, the specifications apply to a complete CMSS 68 Eddy Current Probe System composed of: CMSS 68 Eddy Current Probe, CMSS 958 Extension Cable, and CMSS 668 or CMSS 668P Driver at +23 °C (+73 °F), with a –24 V DC supply and target of AISI 4140 steel.

These specifications may vary with different options and systems.

Cables and enclosures

Cable CMSS 9100/9200	58
Cable assemblies CMSS R6Q/R6SL	59
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Single/double shield twisted pair cable
CMSS 9100/9200

Premium sensor cables provide superior performance in demanding environments

CMSS 9100

The single shield cable is recommended for use with sensors in normal industrial applications where these types of cables have been previously used and installed.

The CMSS 9100 features:

- Tin plated copper conductors
- Heat and flame resistance
- A single shielded, single twisted pair cable
- Conductors individually insulated with DuPont FEP Teflon
- A braided shield with drain wire
- An outer insulated jacket also made of clear DuPont FEP Teflon
- The cable is wrapped with a color tape under the outer insulated jacket and has superimposed on the color tape a white marker tape with cable designation and SKF logo

CMSS 9200

The double shield cable is recommended for use with sensors in industrial applications where there is a high noise field (i.e. machine tools and power generating facilities).

The CMSS 9200 features:

- Tin plated copper conductors
- Heat and flame resistance
- A double shielded, single twisted pair cable
- Conductors individually insulated with DuPont FEP Teflon
- An inner shield of aluminum polyester foil with drain wire
- An inner insulated jacket of DuPont FEP Teflon
- A braided outer shield
- An outer insulated jacket also made of clear DuPont FEP Teflon
- The cable is wrapped with a color tape under the outer insulated jacket and also has superimposed on the color tape a white marker tape with cable designation and SKF logo

Ordering details

Order no.	Description
CMSS 9100-500	150 m *(500 ft. spool)* single shield with continuous cable length
CMSS 9100-1000	300 m *(1 000 ft. spool)* single shield with continuous cable length
CMSS 9200-500	150 m *(500 ft. spool)* double shield with continuous cable length

Cable assemblies
CMSS R6Q/R6SL

Manufactured to your application requirements

Cable assembly IP 68

This rugged MIL-C-5015 style cable assembly can be used with all 2-pin MS connector accelerometers (i.e., CMSS 2100, CMSS 2200, CMSS 793, CMSS 797)

- Q-type connector
- IP 68 (submersible, one meter depth in water)
- High temperature +200 °C *(+392 °F)*
- Standard recommendation for harsh environments
- Manufactured to your application requirements

The IP rating refers to the Ingress Protection as defined by the IEC (International Electrotechnical Commission). IP 68 represents total protection against dust and a water sealing that can withstand submersion for up to 1 meter deep for approximately 15 to 30 minutes.

Ordering details

Order no.	Cable length	Description
CMSS R6QI-9100	**-XX**	Cable assembly IP 68 with grounding on instrument side (Isolated type)
CMSS R6Q-9100	**-XX**	Cable assembly IP 68 with grounding on machine side The cable shield is connected to the sensor casing. The sensor must be mounted on earth grounded machine casing or structural point
	-16	4,87 m *(16 ft.)*
	-32	9,75 m *(32 ft.)*
	-64	19,50 m *(64 ft.)*

Cable assembly IP 66

This MIL-C-5015 style cable assembly can be used with all 2-pin MS connector accelerometers (i.e., CMSS 2100, CMSS 2200, CMSS 793, CMSS 797)

- SL-type connector
- IP 66 (withstands direct water jet)
- Elevated temperature +150 °C *(+302 °F)*
- Premium connector
- Manufactured to your application requirements

The IP rating refers to the Ingress Protection as defined by the IEC (International Electrotechnical Commission). IP 66 represents total protection against dust and water sealing against jets of water.

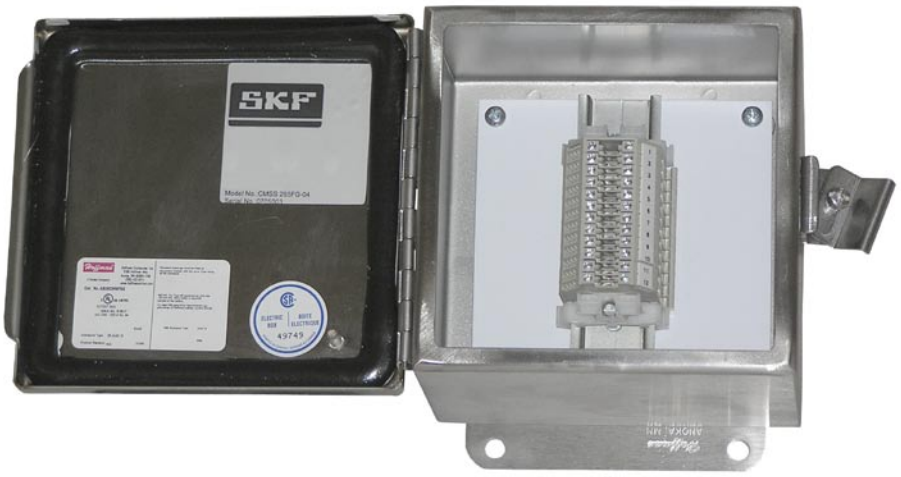
Ordering details

Order no.	Cable length	Description
CMSS R6SLI-9100	**-XX**	Cable assembly IP 66 with grounding on instrument side (Isolated type)
CMSS R6SL-9100	**-XX**	Cable assembly IP 66 with grounding on machine side The cable shield is connected to the sensor casing. The sensor must be mounted on earth grounded machine casing or structural point
	-16	4,87 m *(16 ft.)*
	-32	9,75 m *(32 ft.)*
	-64	19,50 m *(64 ft.)*

Termination junction boxes
CMSS 265 series
Connecting centers by SKF

The CMSS 265 series termination junction boxes are multiple channel connecting centers for terminating the outputs of accelerometers or other transducer field wiring.

Crew clamp, DIN-rail mounted terminals (three inputs per channel, usually signal, common, and shield) are provided for the intermediate termination of accelerometers, proximity probes, speed sensors, RTD's, and other transducers.



NEMA 4X Fiberglass termination junction boxes
CMSS 265FG

The CMSS 265FG NEMA 4X enclosures are made of molded fiberglass polyester which is easily punched or drilled. It has outstanding chemical and temperature resistance and physical properties. A seamless foam in-place gasket provides a watertight and dust tight seal. Screw covers are secured with captivated monel cover screws.

NEMA 4 Powder coated steel termination junction boxes
CMSS 265PS

The CMSS 265PS NEMA 4 enclosure is constructed of 14 gauge mild steel and is ANSI 61 gray polyester powder coated on the all surfaces. A seamless foam in-place gasket provides a water and dust tight seal.

NEMA 4X Stainless steel termination junction boxes
CMSS 265SS

The CMSS 265SS NEMA 4X enclosure is constructed from 14 gauge 304 stainless steel. This enclosure is more resistant in corrosive environments. They feature continuously welded seems that are ground smooth with no holes or knockouts. An oil-resistant, in-place gasket provides a water and dust tight seal. Stainless steel screws and clamps are included.

Ordering details

Order no.	Size	Description; height x width x depth
CMSS 265FG	-XX	NEMA 4X Fiberglass junction box
CMSS 265PS	-XX	NEMA 4 Powder coated steel junction box
CMSS 265SS	-XX	NEMA 4X Stainless steel junction box
	-02	2 channels, 6 terminals; 15,2 x 15,2 x 10,2 cm *(6 x 6 x 4 in.)*
	-04	4 channels, 12 terminals; 15,2 x 15,2 x 10,2 cm *(6 x 6 x 4 in.)*
	-08	8 channels, 24 terminals; 20,3 x 15,2 x 10,2 cm *(8 x 6 x 4 in.)*
	-12	12 channels, 36 terminals; 25,4 x 20,3 x 15,2 cm *(10 x 8 x 6 in.)*
	-16	16 channels, 48 terminals; 35,6 x 30,5 x 20,3 cm *(14 x 12 x 8 in.)*

Ordering example

NEMA 4 Powder coated steel junction box with 4 channels and 12 terminals would be SKF Order no. CMSS 265PS-04.

BNC junction boxes
CMSS 300 series

Easy to use high quality products

The CMSS 300 series BNC junction boxes are multiple channel connecting centers for terminating the outputs of accelerometers or other transducer field wiring. They are normally located in close proximity to the machine to reduce wiring cost and provide convenient access to the vibration signal when using a portable data collector/analyzer.

- More room for wiring and conduit entry
- Short connections for less noise
- Large Monel screw type terminals
- Quick and convenient access to remotely installed accelerometers with portable data collector/analyzer
- Withstands harsh factory and outdoor environments

Internal models are provided with quick access latches and external models with screw covers and protective caps for the BNC fitting. In harsh environments, internal models should be specified. Black and white bezel tagging is provided for channel and switch identification.

NEMA 4X Fiberglass BNC junction boxes
CMSS 300FG

The CMSS 300FG NEMA 4X enclosure is made of molded fiberglass polyester which is easily punched or drilled. It has outstanding chemical and temperature resistance and physical properties. A seamless foam in-place gasket provides a water and dust tight seal. Screw covers are secured with captivated Monel cover screws.

NEMA 4 Powder coated steel BNC junction boxes
CMSS 300PS

The CMSS 300PS powder coated steel NEMA 4 enclosure is constructed of 14 gauge mild steel and is ANSI 61 gray polyester powder coated on all surfaces.

NEMA 4X Stainless steel BNC junction boxes
CMSS 300SS

The CMSS 300SS NEMA 4X stainless steel enclosure is constructed from 14 gauge 304 stainless steel.

Ordering details

Order no.	Size	BNC	Description; height x width x depth
CMSS 300FG	-XX	-XX	NEMA 4X Fiberglass BNC junction box
	-01		1 Channel; 16,5 x 16,5 x 10,8 cm *(6.5 x 6.5 x 4.25 in.)*
	-02		2 Channels; 16,5 x 16,5 x 10,8 cm *(6.5 x 6.5 x 4.25 in.)*
	-04		4 Channels; 21,6 x 16,5 x 10,8 cm *(8.5 x 6.5 x 4.25 in.)*
	-06		6 Channels; 21,6 x 16,5 x 10,8 cm *(8.5 x 6.5 x 4.25 in.)*
CMSS 300PS	-XX	-XX	NEMA 4 Powder coated steel BNC junction box
	-01		1 Channel; 19,1 x 17,8 x 10,2 cm *(7.5 x 7.0 x 4.0 in.)*
	-02		2 Channels; 19,1 x 17,8 x 10,2 cm *(7.5 x 7.0 x 4.0 in.)*
	-04		4 Channels; 24,1 x 17,8 x 8,9 cm *(9.5 x 7.0 x 3.5 in.)*
	-06		6 Channels; 24,1 x 17,8 x 8,9 cm *(9.5 x 7.0 x 3.5 in.)*
CMSS 300SS	-XX	-XX	NEMA 4 Stainless steel BNC junction box
	-01		1 Channel; 19,1 x 12,7 x 10,2 cm *(7.5 x 5.0 x 4.0 in.)*
	-02		2 Channels; 19,1 x 12,7 x 10,2 cm *(7.5 x 5.0 x 4.0 in.)*
	-04		4 Channels; 24,1 x 17,8 x 10,2 cm *(9.5 x 7.0 x 4.0 in.)*
	-06		6 Channels; 24,1 x 17,8 x 10,2 cm *(9.5 x 7.0 x 4.0 in.)*
		-01	Internal BNC
		-02	External BNC

Ordering example

NEMA 4 Power coated steel BNC junction box with 4 channels and an external BNC would be SKF Order no. CMSS 300 PS-04-02

Switchable BNC junction boxes
CMSS 310 series

Convenient, quick, and safe

The CMSS 310 series switchable BNC junction boxes are designed for terminating and switching the outputs of up to 48 accelerometers. They are installed in a location as close to the machine as practical to reduce wiring cost and yet provide convenient, safe access to the vibration signal by an operator with a portable data collector/analyzer.

- RoHS compliant
- Easier wiring, switch module (front panel) can be disconnected from the back board
- Large Monel screw type terminals

Both internal and external switch/BNC models are available. Internal models are provided with quick access latches, and external models with screw covers and protective caps for the BNC fitting. In harsh environments, internal models should be specified. Black and white bezel tagging is provided for channel and switch identification.

NEMA 4X Fiberglass switchable BNC junction boxes *(FG) CMSS 310FG*

The CMSS 310FG NEMA 4X fiberglass enclosure is made of molded fiberglass polyester which is easily punched or drilled. It has outstanding chemical and temperature resistance and physical properties. A seamless foam in-place gasket provides a water and dust tight seal. Screw covers are secured with captivated Monel cover screws.

NEMA 4 Powder coated steel switchable BNC junction boxes *(PS) CMSS 310PS*

The CMSS 310PS NEMA 4 powder coated steel enclosure is constructed of 14 gauge mild steel and is ANSI 61 gray polyester powder coated on all surfaces.

NEMA 4X Stainless steel switchable BNC junction boxes *CMSS 310SS*

The CMSS 310SS NEMA 4X stainless steel enclosure is constructed from 14 gauge 304 stainless steel.

Ordering details

Order no.	Size	BNC	Description; height x width x depth
CMSS 310FG	-XX	-XX	NEMA 4X Fiberglass switchable BNC junction box
CMSS 310PS	-XX	-XX	NEMA 4 Powder coated steel switchable BNC junction box
CMSS 310SS	-XX	-XX	NEMA 4X Stainless steel switchable BNC junction box
	-06		6 Channels; 24,1 x 17,8 x 8,9 cm *(9.5 x 7 x 3.5 in.)**
	-12		12 Channels; 24,1 x 17,8 x 8,9 cm *(9.5 x 7 x 3.5 in.)**
	-24		24 Channels; 39,4 x 33,0 x 15,2 cm *(15.5 x 13 x 6 in.)*
	-32		32 Channels; 44,5 x 38,1 x 15,2 cm *(17.5 x 15 x 6 in.)*
	-48		48 Channels; 44,5 x 38,1 x 15,2 cm *(17.5 x 15 x 6 in.)*
		-01	Internal BNC
		-02	External BNC

* Dimensional depth is 10,2 cm *(4 in.)* for Stainless steel version.

Ordering example

NEMA 4 Powder coated switchable BNC junction box with 32 channels and an internal BNC would be SKF Order no. CMSS 310PS-32-01.

Technical data

Single/double shield twisted pair cable (page 58)

Designation	Description
Conductors	Tin plated copper, 19 x 32 strands, size 0,52 mm^2 *(20 AWG)* (American Wire Gauge)
Color code	Black and white pair, cable color is yellow with white SKF label
Outer jacket diameter	4,826 mm (±0,127 mm), *0.190 in. (±0.005 in.)*, includes glass fillers for roundness
Wire materials	All conductors, drain wires and braided shields are of tin plated copper
Capacitance	Approximately 89 pF/m *(27 pF/ft.)*
Voltage rating	600 V RMS
Working temperature range	–80 to +200 °C *(–112 to +392 °F)*
Heat and flame resistance	Meets requirements of UL 910 Stiner Tunnel test

Reliability Maintenance Institute Training

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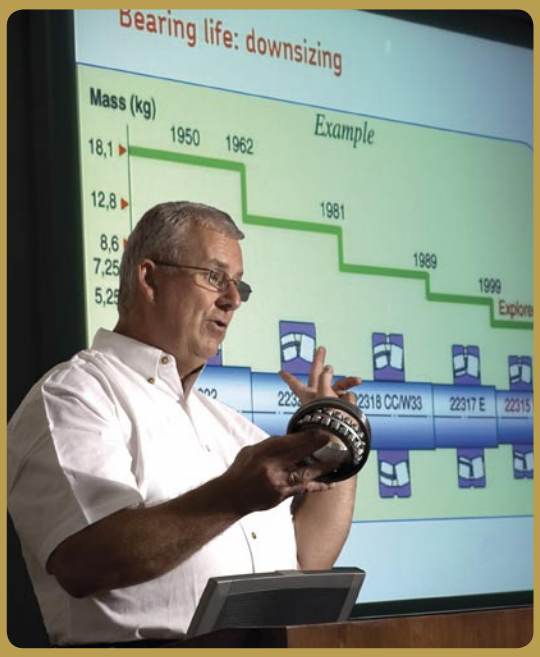


Reliability Maintenance Institute training

Equip your people to deliver results

The Reliability Maintenance Institute is your resource to help meet challenging business targets. A key focus area is to manage the total cost of ownership by increasing machine reliability and uptime. To leverage your invested capital in machinery and equipment, it is essential to continuously develop your people as you increase efficiency and productivity.

Benefits of training

- Achieve higher levels of personnel and machine efficiency
- Eliminate machinery problems to increase reliability and productivity
- Determine and fix the root cause of machine and component problems
- Reduce accidental damage or under-utilization of equipment
- Increase machine uptime and productivity
- Enhance plant safety

Unique learning environments

The Reliability Maintenance Institute offers a mix of course types and venues to meet your specific training needs. On-site training is available at your plant or facility and many classes are held at SKF training centers and other regional locations, bringing the subject matter closer to you.

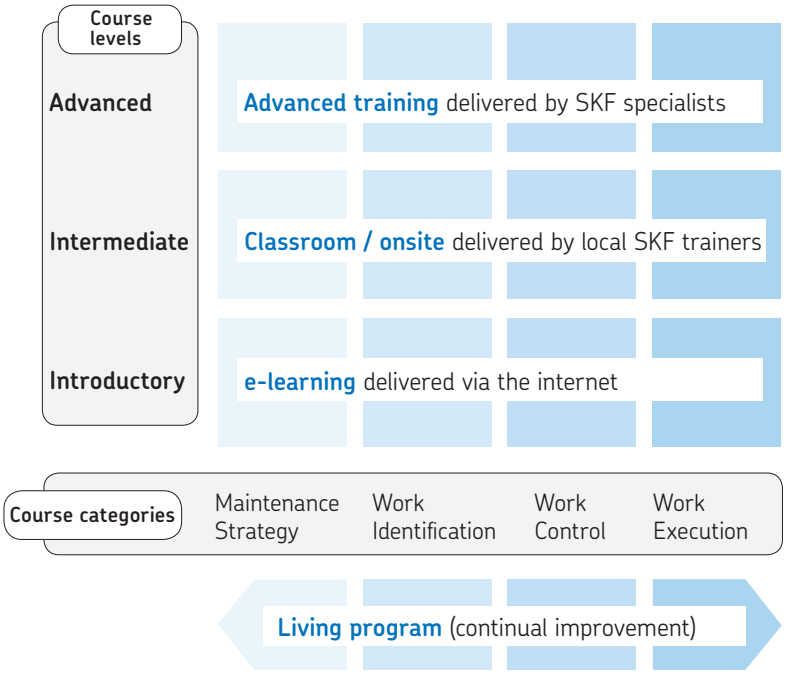
- RMI classroom and regional classroom
- On-site classroom courses and customized training
- Web-based courses
- Computer based training
- Mentoring

Blended learning

Our established classroom training approach is now complemented with a package of self-study materials with selected on-line courses and reference material. These materials are accessed via the @ptitude Exchange website (http://www.aptitudexchange.com)

The SKF reliability and maintenance portfolio structure

The course portfolio is designed around the SKF Asset Efficiency Optimization (AEO) workflow process and has been created to allow participants to gain the knowledge and expertise in a structured development path. It uses an array of technologies such as on-line, classroom and mentoring to reach the learning objectives.



Course categories

While specific course topics vary widely, RMI training courses are organized to match the following facets of the SKF Asset Efficiency Optimization workflow process:

Work Execution

Relates to methods and technologies used to complete maintenance tasks. Course topics include precision maintenance, best practices in lubrication, installation, precision alignment, balancing, and post maintenance testing.

Course no.	Description
WE201	Bearing Maintenance and Technology
WE202	Bearings in Rotating Machinery Applications
WE203	Lubrication in Rolling Element Bearings
WE204	Root Cause Bearing Damage Analysis
WE212	Bearing Reliability for the Aggregate and Cement Industries
WE214	Bearing Reliability in Paper Machines
WE216	Machine Tool Reliability
WE220	Wind Turbine Shop Bearing Maintenance
WE221	Wind Turbine Uptower Bearing Maintenance
WE240	Precision Laser Alignment
WE241	Precision Maintenance Skills - Part 1
WE242	Precision Maintenance Skills - Part 2
WE250	Precision Field Balancing
WE291	Aeroengine Bearing Inspection: Level I
WE303	Advanced Lubrication

Work Control

Relates to methods and technologies used to control maintenance work. Course topics include maintenance planning and scheduling, standard job plans, spare parts alignment, and supply and logistics.

Course no.	Description
WC200	Planning & Scheduling
WC230	Spare Parts

Work Identification

Relates to methods and technologies used to identify maintenance work. Course topics include preventive maintenance, predictive technologies, information integration and decision support systems, and work order request generation.

Course no.	Description
WI201	Fundamentals of Machine Condition
WI202	ISO 18436 Part 2 Vibration Analysis Category 1 (BINDT Accredited)
WI203	ISO 18436 Part 2 Vibration Analysis Category 2 (BINDT Accredited)
WI205	Vibration Troubleshooting for Reliability
WI210	Vibration Analysis ISO Category I
WI211	Vibration Analysis ISO Category II
WI212	Vibration Analysis ISO Category III
WI213	Vibration Analysis ISO Category IV
WI304	Advanced Vibration Analysis
WI305	Applied Modal and Operating Deflection Shape Analysis
WI321	Airborne Ultrasound-Level I
WI322	Airborne Ultrasound-Level II
WICM350	Advanced Microlog & Machine Analyst

Maintenance Strategy

Relates to methods and technologies used to develop a comprehensive maintenance strategy. Courses emphasize a technically and financially sound maintenance strategy developed to match business goals.

Course no.	Description
MS212	Managing Proactive Reliability Maintenance Programs
MS230	Maintenance Strategy Review
MS241	Asset Management Support Tool
MS300	Asset Reliability Improvement
MS331	Maintenance Strategy Review
MS332	Reliability Centered Maintenance

Specialty courses

Course no.	Description
LP 200	Root Cause Analysis
LP 390	SiteMentor
OEM301	Bearing System Design
OSHA 10	OSHA 10 hour safety program

SmartStart on-site product start-up training

SmartStart is an on-site product startup service that focuses on a specific product or system. It is designed to get that product up and running, your employees trained, and your program implemented quickly and effectively.

Benefits of SmartStart training

- Small class size
- Individual instruction
- Field exercises on your plant's machinery
- Standardized plant-wide procedures

How is SmartStart training conducted?

SmartStart instructors will provide you with real world application expertise by using your actual plant applications and requirements. The training is designed to take the form of mentoring rather than traditional classroom instruction.

The site instructor will offer guidance in applicable product and/or database optimization and functionality. Furthermore, the instructor will offer insightful, pragmatic information that will provide you with powerful tools for predictive maintenance requirements.

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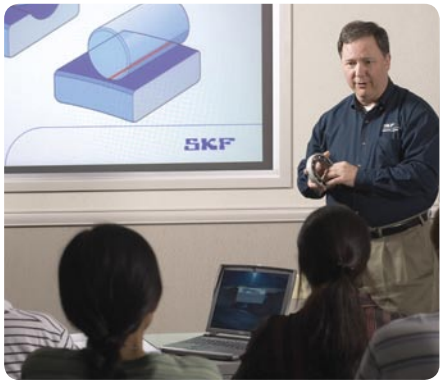

SmartStart courses

Course no.	Description
WICM232	Marlin and Aptitude Analyst Inspector
WICM253	MX Series Microlog and System Software (included in the Microlog Analyzer MX bundled package. See page 32 for details.)
WICM263	GX Series Microlog and SKF @ptitude Analyst (included in the Microlog Analyzer GX-E and GX-M bundled packages. See pages 33 and 34 for details.)
WICM264	AX Series Microlog and SKF @ptitude Analyst (included in the Microlog Analyzer AX-M bundled package. See page 35 for details.)
WICM271	SKF Copperhead Series On-line System
WICM272	IMx System and Aptitude Observer
WE255	Balancing with an SKF Microlog
WE245	TMEA Series Laser Shaft Alignment

Where is SmartStart training conducted?

Training is conducted at your site, in your training facility, using your computers and SKF purchased hardware and/or software.

What's included in SmartStart training?

SmartStart training packages include a qualified SKF instructor, all travel and living expenses for the instructor, up to five training kits, on-site consulting, and start-up assistance. SmartStart is priced to include up to five participants (there is an extra charge for more participants).

Reliability Maintenance Institute On-line

Learn at your own place and pace. The on-line area of Reliability Maintenance Institute offers an expanding range of e-learning courses covering a range of topics. This enables self-paced learning to be enjoyed by the participant at the time and place that best suits their situation.

These e-learning courses are an integral part of Reliability Maintenance Institute's extensive training portfolio. They are designed to complement the higher level courses that are delivered by our specialist training staff. Like RMI's classroom training, RMI On-line courses are structured according to the five facets of SKF's Asset Efficiency Optimization process.

An RMI on-line subscription includes access to all listed courses for one year per person. (Part # AEX-RMI)

Maintenance Strategy courses

Course no.	Description
MS 100	AEO Basics
MS 101	Assessment Basics
MS 120	Operator Driven Reliability
MS 130	Maintenance Strategy Review

Work Identification courses

Course no.	Description
WI 100	Vibration Basics
WI 130	Thermography Basics
WI 140	Lubrication Analysis Basics

Work Control course

Course no.	Description
WC 130	Spare Parts Management

Work Execution courses

Course no.	Description
WE 104	Bearing Damage Analysis Basics
WE 140	Shaft Alignment Basics
WE 150	Balancing Basics
WE 170	Basics of Industrial Seals for Rotating Motion

General reference courses

Course no.	Description
GRB 001	Bearing Basics
GRB 002	Spherical Roller Bearings
GRB 003	Angular Contact Ball Bearings
GRB 004	CARB Toroidal Roller Bearings
GRB 005	Tapered Roller Bearings
GRB 006	Deep Groove Ball Bearings
GRL 001	Lubrication Basics

Product courses

Course no.	Description
PT-MCA1	SKF Machine Condition Advisor
MT-MV1B1	SKF MicroVibe

For more information

Visit www.skf.com or your local SKF representative for the complete details about SKFs training offering including:

- Current training catalogue
- Course schedules and locations
- Course syllabus including objectives, description, prerequisites and length of course
- Tuition costs
- Registration information
- Instructor profiles

Ordering details

Order no.	Description
AEX-RMI	One year Reliability Maintenance Institute on-line subscription, for one individual

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SKF – the knowledge engineering company

From the company that invented the self-aligning ball bearing more than 100 years ago, SKF has evolved into a knowledge engineering company that is able to draw on five technology platforms to create unique solutions for its customers. These platforms include bearings, bearing units and seals, of course, but extend to other areas including: lubricants and lubrication systems, critical for long bearing life in many applications; mechatronics that combine mechanical and electronics knowledge into systems for more effective linear motion and sensorized solutions; and a full range of services, from design and logistics support to condition monitoring and reliability systems.

Though the scope has broadened, SKF continues to maintain the world's leadership in the design, manufacture and marketing of rolling bearings, as well as complementary products such as radial seals. SKF also holds an increasingly important position in the market for linear motion products, high-precision aerospace bearings, machine tool spindles and plant maintenance services.

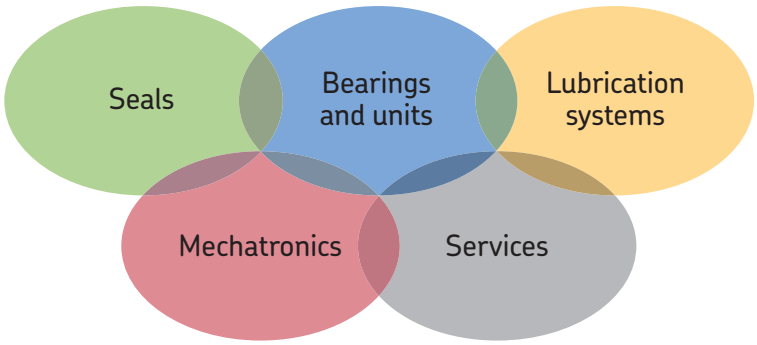
The SKF Group is globally certified to ISO 14001, the international standard for environmental management, as well as OHSAS 18001, the health and safety management standard. Individual divisions have been approved for quality certification in accordance with ISO 9001 and other customer specific requirements.

With over 100 manufacturing sites worldwide and sales companies in 70 countries, SKF is a truly international corporation. In addition, our distributors and dealers in some 15 000 locations around the world, an e-business marketplace and a global distribution system put SKF close to customers for the supply of both products and services. In essence, SKF solutions are available wherever and whenever customers need them. Overall, the SKF brand and the corporation are stronger than ever. As the knowledge engineering company, we stand ready to serve you with world-class product competencies, intellectual resources, and the vision to help you succeed.

© Airbus – photo: e³m company, H. Goussé

Evolving by-wire technology
SKF has a unique expertise in the fast-growing by-wire technology, from fly-by-wire, to drive-by-wire, to work-by-wire. SKF pioneered practical fly-by-wire technology and is a close working partner with all aerospace industry leaders. As an example, virtually all aircraft of the Airbus design use SKF by-wire systems for cockpit flight control.

SKF is also a leader in automotive by-wire technology, and has partnered with automotive engineers to develop two concept cars, which employ SKF mechatronics for steering and braking. Further by-wire development has led SKF to produce an all-electric forklift truck, which uses mechatronics rather than hydraulics for all controls.



Harnessing wind power
The growing industry of wind-generated electric power provides a source of clean, green electricity. SKF is working closely with global industry leaders to develop efficient and trouble-free turbines, providing a wide range of large, highly specialized bearings and condition monitoring systems to extend equipment life of wind farms located in even the most remote and inhospitable environments.

Working in extreme environments
In frigid winters, especially in northern countries, extreme sub-zero temperatures can cause bearings in railway axleboxes to seize due to lubrication starvation. SKF created a new family of synthetic lubricants formulated to retain their lubrication viscosity even at these extreme temperatures. SKF knowledge enables manufacturers and end user customers to overcome the performance issues resulting from extreme temperatures, whether hot or cold. For example, SKF products are at work in diverse environments such as baking ovens and instant freezing in food processing plants.

Developing a cleaner cleaner
The electric motor and its bearings are the heart of many household appliances. SKF works closely with appliance manufacturers to improve their products' performance, cut costs, reduce weight, and reduce energy consumption. A recent example of this cooperation is a new generation of vacuum cleaners with substantially more suction. SKF knowledge in the area of small bearing technology is also applied to manufacturers of power tools and office equipment.

Maintaining a 350 km/h R&D lab
In addition to SKF's renowned research and development facilities in Europe and the United States, Formula One car racing provides a unique environment for SKF to push the limits of bearing technology. For over 60 years, SKF products, engineering and knowledge have helped make Scuderia Ferrari a formidable force in F1 racing. (The average racing Ferrari utilizes around 150 SKF components.) Lessons learned here are applied to the products we provide to automakers and the aftermarket worldwide.

Delivering Asset Efficiency Optimization
Through SKF Reliability Systems, SKF provides a comprehensive range of asset efficiency products and services, from condition monitoring hardware and software to maintenance strategies, engineering assistance and machine reliability programmes. To optimize efficiency and boost productivity, some industrial facilities opt for an Integrated Maintenance Solution, in which SKF delivers all services under one fixed-fee, performance-based contract.

Planning for sustainable growth
By their very nature, bearings make a positive contribution to the natural environment, enabling machinery to operate more efficiently, consume less power, and require less lubrication. By raising the performance bar for our own products, SKF is enabling a new generation of high-efficiency products and equipment. With an eye to the future and the world we will leave to our children, the SKF Group policy on environment, health and safety, as well as the manufacturing techniques, are planned and implemented to help protect and preserve the earth's limited natural resources. We remain committed to sustainable, environmentally responsible growth.

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